

**A STUDY OF METHODS USED IN
MEASUREMENT AND ANALYSIS OF SEDIMENT LOADS IN STREAMS**



CATALOG

**INSTRUMENTS AND REPORTS FOR
FLUVIAL SEDIMENT INVESTIGATIONS
FEDERAL INTER-AGENCY SEDIMENTATION PROJECT**

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Federal Inter-Agency Sedimentation Project
St. Anthony Falls Hydraulic Laboratory
Two Third Avenue S.E.
Minneapolis, Minnesota 55414-2196

Telephone 612 349-3352
FTS 787-3352

A Cooperative Project
Sponsored by the
Interagency Advisory Committee on Water Data
Subcommittee on Sedimentation

Project Participating Agencies

Agricultural Research Service	
Corps of Engineers	** Geological Survey
Forest Service	** Bureau of Reclamation
Federal Highway Administration	** Bureau of Land Management

March 1986

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PREFACE

This catalog was prepared to assist those involved in ordering sampling and analyzing equipment for sediment investigations. This publication which supersedes all project catalogs issued prior to March 1986, illustrates all current instruments and supplies. Obsolete equipment has been deleted and the remaining items have been indexed by categories. Additional photographs and drawings are included.

The Federal Interagency Sedimentation Project is sponsored by the Subcommittee on Sedimentation, a subcommittee of the Interagency Advisory Committee on Water Data. Project activities are reviewed by the Technical Committee composed of representatives from each agency that sponsors the project. Agencies interested in technical committee membership should contact the Project Chief for additional information.

Reports pertaining to development and theory of equipment operation, and to sampling and computational methods are listed in the back of this catalog. Questions regarding theory and operation should be addressed to the Project Chief, Federal Interagency Sedimentation Project.

To insure that instruments listed in this catalog are available at the lowest possible cost, equipment is procured through competitive bidding administered by the District Engineer, U.S. Army Engineer District, 1135 Post Office Building, St. Paul, Minnesota 55101-1479. Fabricated instruments are delivered to project personnel who inspect, adjust, then stock the equipment for supply. The project provides repair services and parts for all equipment listed in this catalog. Contact the project for shipping instructions and repair charge estimates.

Because the project is federally staffed and funded it operates on a cost reimbursement, non-profit basis. Equipment costs are based on bid costs including jigs and patterns, inspection, packing, handling, and shipment, preparation of operating manuals, clerical work, and a prorated overhead. Costs for individual items are maintained at a minimum, consequently no discount is offered for quantity purchases.

Through authority granted by a guidance memorandum (September 1978) equipment developed by the project is available to all Federal, State, and Local governmental

agencies. Other interested parties may purchase the equipment direct from bidders, but samplers obtained directly from private vendors are uncalibrated. Orders for suspended-sediment samplers should stipulate calibration. In turn, vendors or purchasers may request project calibration and documentation.

Equipment orders should be forwarded on a fund-obligating document such as a purchase order. Telephone inquiries are invited; but because most equipment items are property-controlled, equipment cannot be shipped before receipt of purchase order.

Donald Benson, a project staff member and employee of the U.S. Army Corps of Engineers, St. Paul District, supervised preparation of this catalog. Funding was provided by the Corps of Engineers and the U.S. Geological Survey.

Depth-integrating suspended-sediment wading-type sampler,
US DH-48

This is a light-weight sampler for collection of suspended-sediment samples where wading rod sampler suspension is used.

The sampler consists of a streamlined aluminum casting, 13-inches long, which partially encloses a round pint milk bottle sample container (not furnished). A modified DH-48 that will accommodate a square pint milk bottle is also available. The sampler weighs 4 1/2 pounds including sample container. A nylon intake nozzle extends horizontally from the nose of the sampler body. A streamlined projection, pointing toward the rear on the side of the sampler head, accommodates the air exhaust port from which air may escape from the bottle as the sample is being collected. A standard 1/2-inch wading rod (not furnished) is threaded into the top of the sampler body for suspending the sampler. The sampler container is held in place and sealed against a rubber gasket in the sampler head, by a hand-operated spring-tensioned clamp at the rear of the sampler. The instrument can sample to within 3 1/2-inches

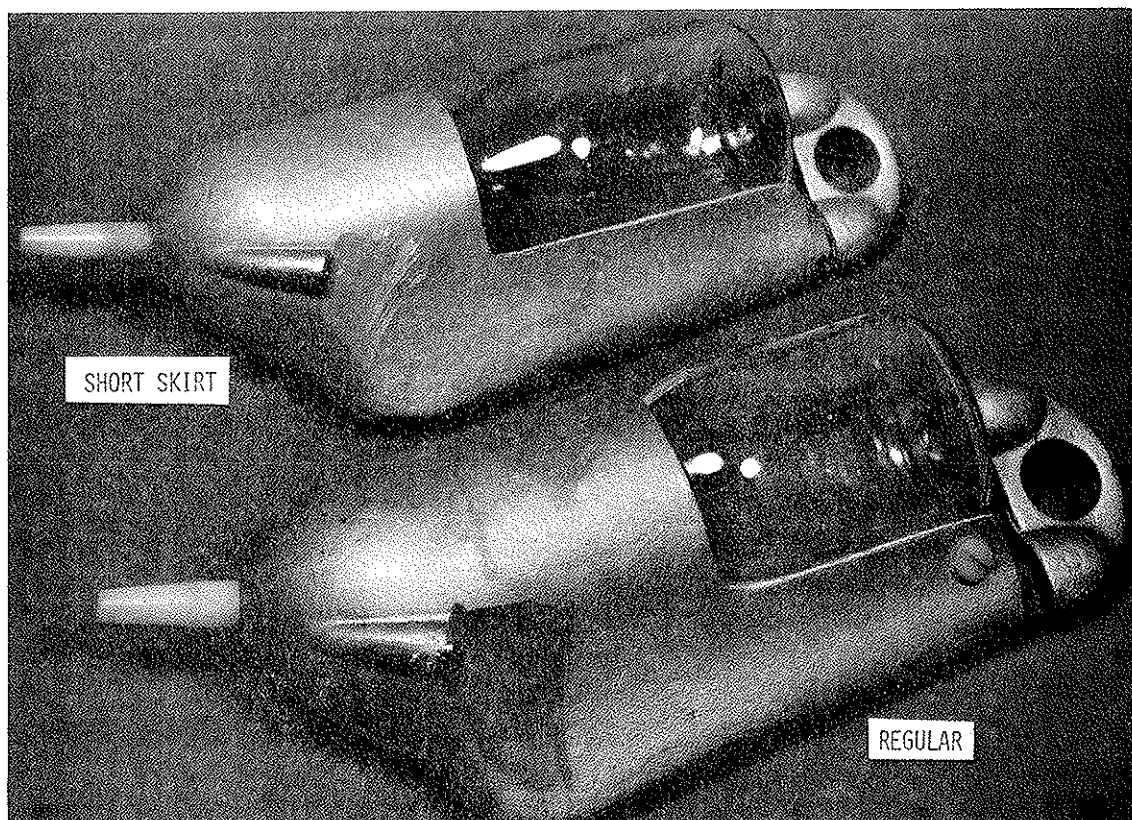
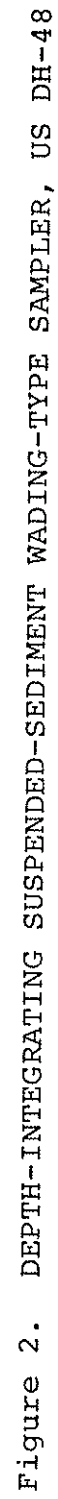
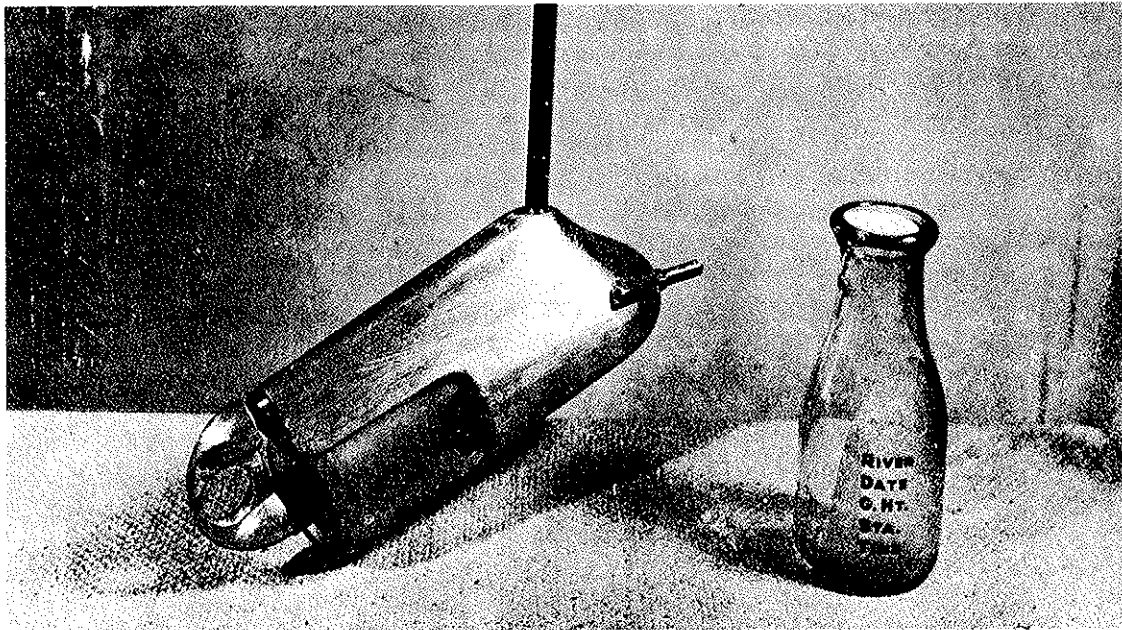
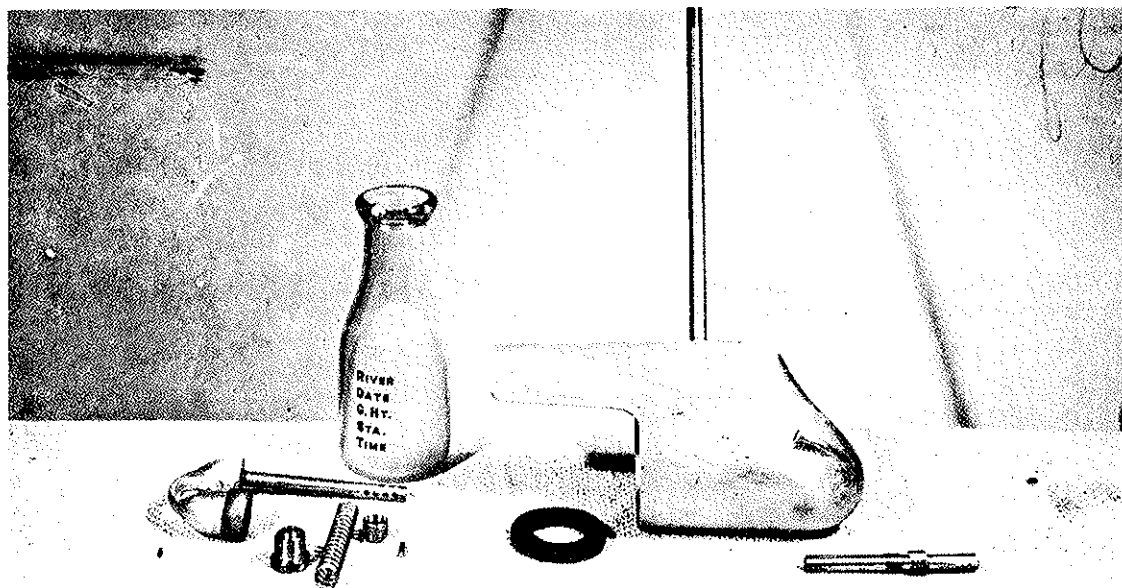


Figure 1. SHORT SKIRT AND REGULAR US DH-48





Assembled sampler with extra pint milk bottle



Disassembled sampler

FIG. 3 – DEPTH-INTEGRATING WADING TYPE HAND SAMPLER, US DH-48

of the stream bed. The sampler is calibrated with a 1/4-inch inside-diameter nozzle. A photograph and a drawing of the sampler are shown in figures 1 and 2.

In sampling operation, the intake nozzle is oriented into the current and held in a horizontal position while the sampler is lowered into the stream. The sampler is lowered at a uniform rate from the water surface to the bottom of the stream, instantly reversed, and then raised again to the water surface at a uniform rate. The sampler continues to take its sample throughout the time of submergence. At least one suspended-sediment sample should be taken at each vertical selected in the stream cross section. A clean bottle is used for each sample.

Information on the sampler also is found in Report No. 6. A copy of operation instructions, Report J, is furnished with each purchased sampler. Further information on sampling techniques may be found in Report 14, and in the National Handbook of Recommended Methods for Water-Data Acquisition (chp. 3, 1977, U.S. Geological Survey).

—HYDRAULIC CHARACTERISTICS—

Available nozzle size = 1/4" (0.64 cm)
(yellow colored nozzle only)

Maximum allowable depth varies with nozzle and container sizes as follows:

<u>nozzle size</u>	<u>pint container</u>	<u>quart container</u>
1/4" (0.64 cm)	2.7 m (8.86 ft)	4.9 m (16.1 ft)

Maximum calibrated velocity = 2.7 m/s (8.86 ft/s)

Distance between nozzle and sampler bottom =
90 mm (3.54 in)

—PHYSICAL CHARACTERISTICS—

Overall length (less nozzle) = 9 5/8" (24.4 cm)

Approximate width = 3 3/16" (8.1 cm)

Weight = 3 1/2 lbs. (1.59 kg)

Shipping weight = 5 lbs. (2.27 kg)

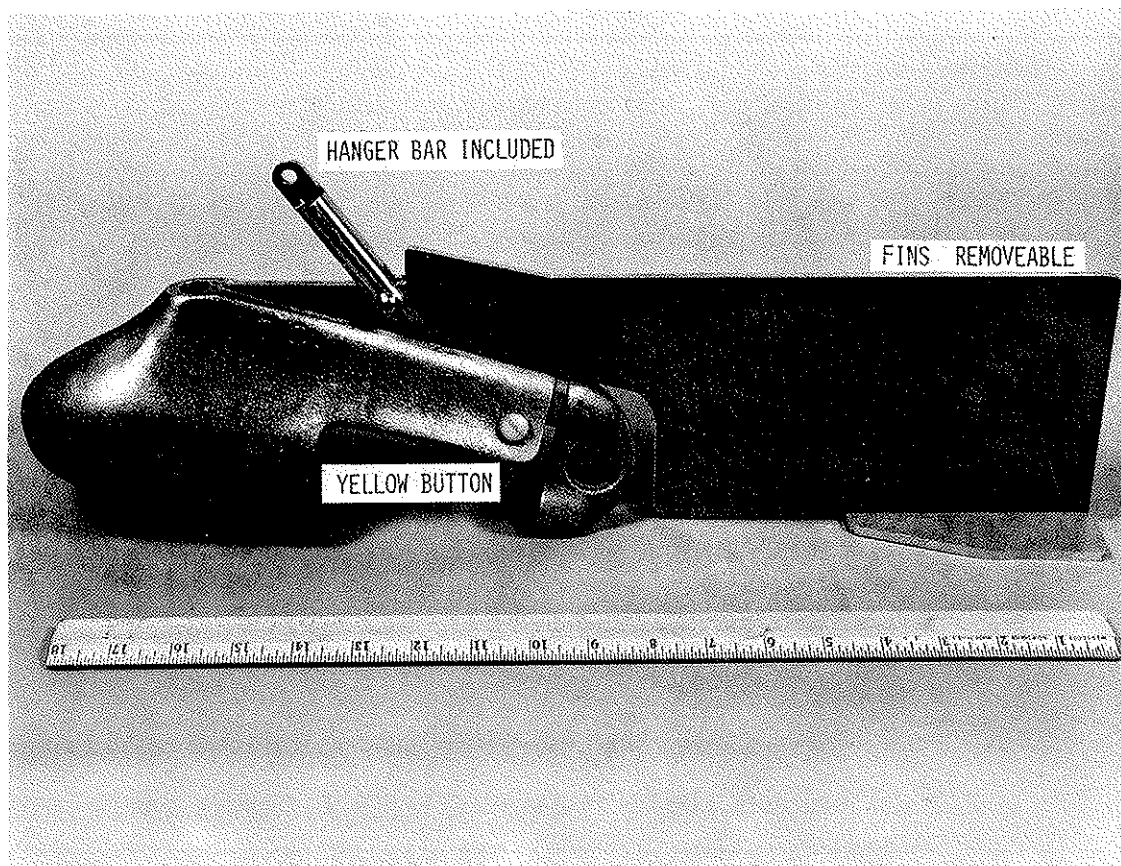
—SHIPPING INFORMATION—

Box dimensions = $12 \frac{1}{2} \times 4 \frac{1}{2} \times 4 \frac{1}{2}$ in.
(31.75 x 11.43 x 11.43 cm)

Box volume = 0.15 ft^3 (4,150 cm^3)

Depth-integrating suspended-sediment wading or
hand-line sampler, US DHS-48

The US DHS-48 is basically a DH-48 that has been adapted so that it can be used as both a wading or hand-line sampler. For hand-line applications the vertical fins, horizontal fins, and hangar bar are attached to the sampler. For wading applications the fins and hangar bar are removed and the sampler is screwed to a wading rod. In addition to the fins and hangar bar, two nozzles and gaskets are also provided. For other details see the section on the DH-48.



—PHYSICAL CHARACTERISTICS—

Overall length (less nozzle)	=	20" (50.8 cm)
Approximate width	=	3 3/16" (8.1 cm)
Weight	=	5 pounds (2.27 kg)
Shipping weight	=	7 pounds (3.18 kg)

Figure 1. WADING OR HAND-LINE SAMPLER, US DHS-48

Depth-integrating suspended-sediment wading-type sampler,
US DH-75-P and US DH-75-Q

This is a light-weight, freeze-resistant sampler for collection of suspended-sediment samples where wading-rod suspension is used. It was designed for use in sub-freezing winter conditions. The open sheet-metal body of this sampler provides easier removal of the sampler container when ice forms over the sampler as it leaves the stream. The low mass of the sampler also defrosts more rapidly than the US DH-48.

The cadmium-plated shell body has two internally threaded bosses: the one on the front for the 3/16-inch, internal-diameter nylon nozzle, and the other on top to accept a standard 1/2-inch diameter wading rod (not furnished). Also welded to the front face is a 180° air-exhaust tube and its brace. A retainer piece with a pull ring holds the container in by means of cotton-covered rubber shock cord. A cast silicone rubber stopper completes the sampler. A photograph of the sampler is shown in figure 1.

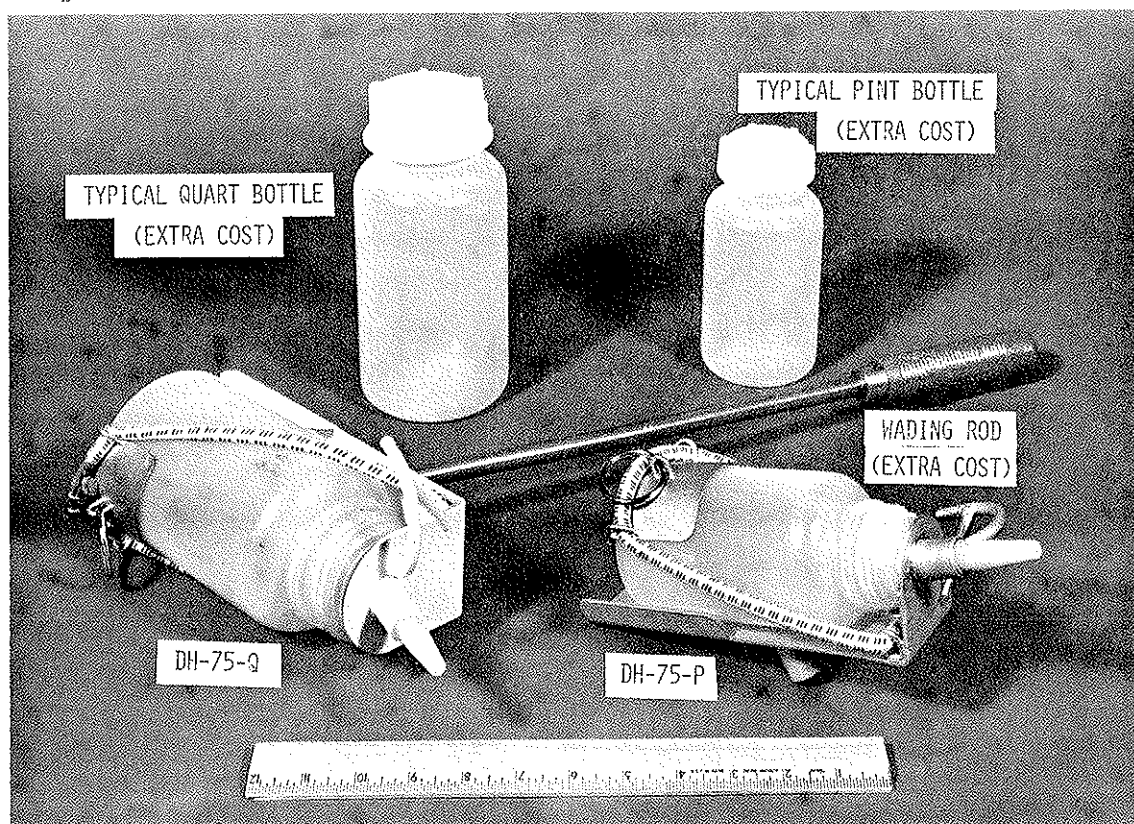


Figure 1. US DH-75 SAMPLERS AND ACCESSORIES

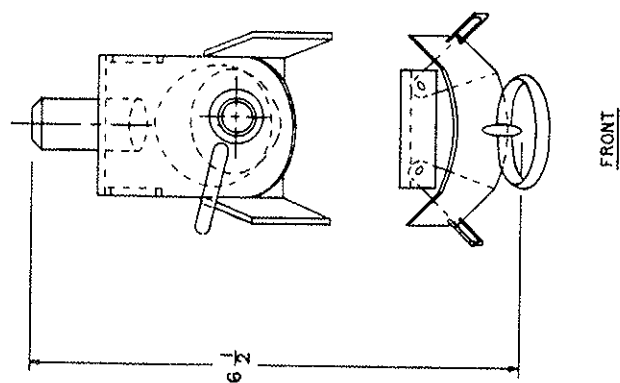
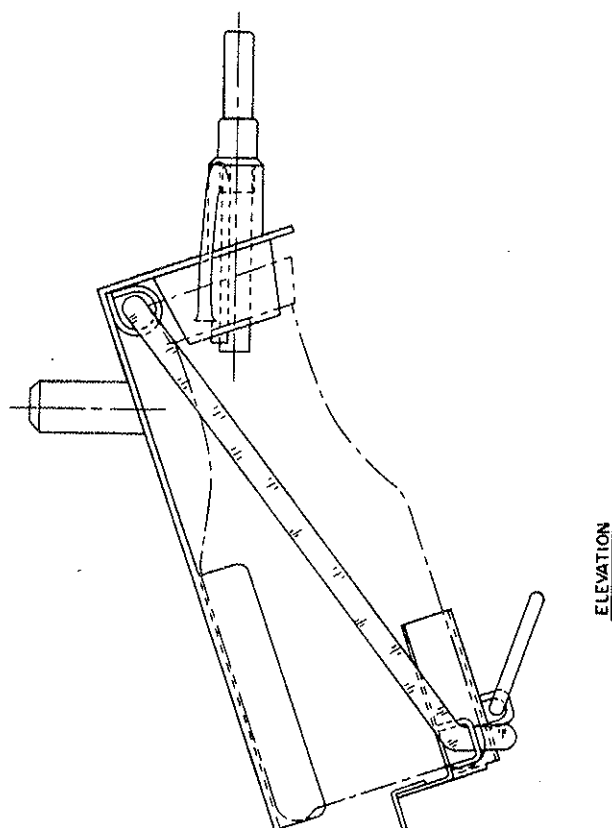
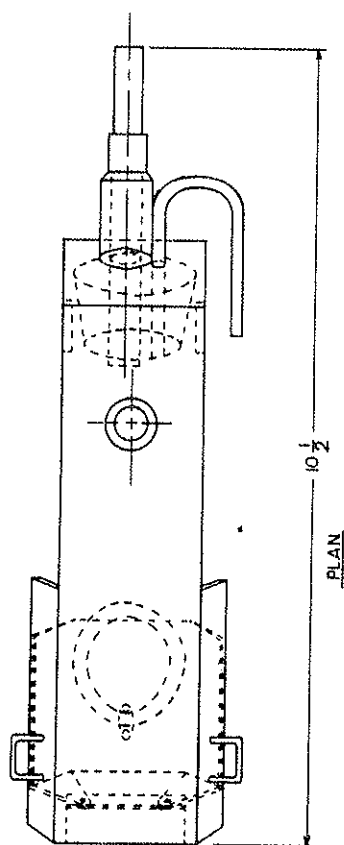


Figure 2. DEPTH-INTEGRATING SUSPENDED-SEDIMENT WADING-TYPE SAMPLER, US D-75

This sampler is offered in two sizes: The pint sampler, DH-75-P, accepts a particular plastic bottle (Bel-Art #F-10906, 1000 cc). The quart sampler, DH-75-Q, has a stopper designed to accept a variety of quart/liter bottles.

The sampling techniques are similar to those used with the DH-48. Note; the quart version does not sample deeper than the pint version.

Both samplers are available in an epoxy-painted, trace-metal version.

—HYDRAULIC CHARACTERISTICS—

Available nozzle size = 3/16" (0.48 cm)
(natural colored nozzle only)

Maximum allowable depth varies with nozzle and container sizes as follows:

<u>nozzle size</u>	<u>pint container</u>	<u>quart container</u>
3/16" (0.48 cm)	4.9 m (16 ft)	4.9 m (16 ft)

Maximum calibrated velocity = 2.0 m/s (6.6 ft/s)

DH-75-Q distance between nozzle and sampler bottom =
114 mm (4.49 in)

DH-75-P distance between nozzle and sampler bottom =
83 mm (3.27 in)

—PHYSICAL CHARACTERISTICS—

Overall length (less nozzle) = 9 1/4" (23.5 cm)

Approximate width = 4 1/4" (10.8 cm)

Weight = 1 1/2 lbs (0.68 kg)

Shipping weight = 2 1/2 lbs (1.1 kg)

Height = 3 1/2" (8.89 cm)

—SHIPPING INFORMATION—

Box dimensions = 12 1/2 x 4 1/2 x 4 1/2 in.
(31.75 x 11.43 x 11.43 cm)

Box volume = 0.15 ft³ (4,150 cm³)

Depth-integrating suspended-sediment hand-line sampler,
US DH-59

This is a medium-weight, suspended-sediment sampler for attachment to a hand-line type of suspension. The sampler can be lowered and raised hand-over-hand with a flexible suspension line.

This sampler comprises a streamlined bronze casting, 15-inches long, which partially encloses a round pint-size glass milk bottle. To meet the requirements of certain types of chemical sampling applications special epoxy-coated DH-59's equipped with nylon nozzles and nozzle sleeves are available. Either sampler weighs approximately 22 pounds and is equipped with a tail-vane assembly to orient the intake nozzle of the sampler into the approaching flow as the sampler enters the water. The glass-bottle sample container is sealed against a gasket in the head cavity of the casting by pressure applied to the base of the bottle by a hand-operated, spring-tensioned, pull-rod assembly at the tail of the sampler. Suspended-sediment samples, collected by the intake nozzle projecting horizontally upstream from the head of the casting, are discharged

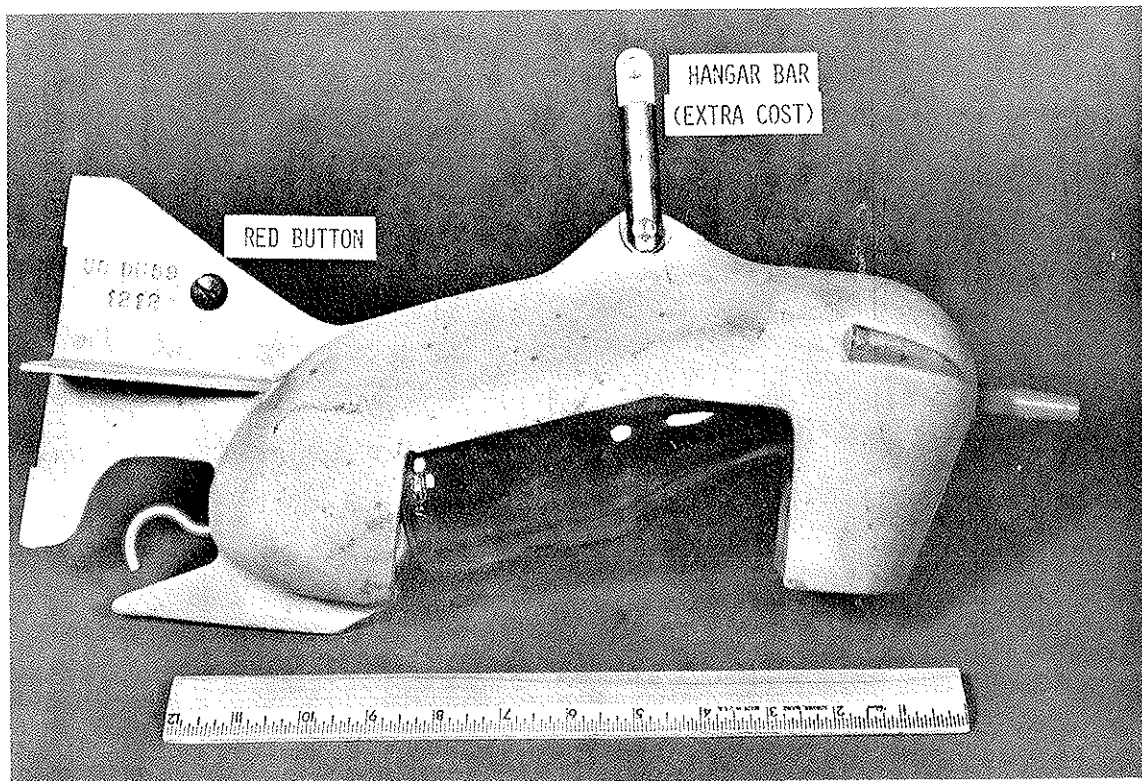


Figure 1. DEPTH-INTEGRATING SUSPENDED-SEDIMENT
HAND-LINE SAMPLER US DH-59

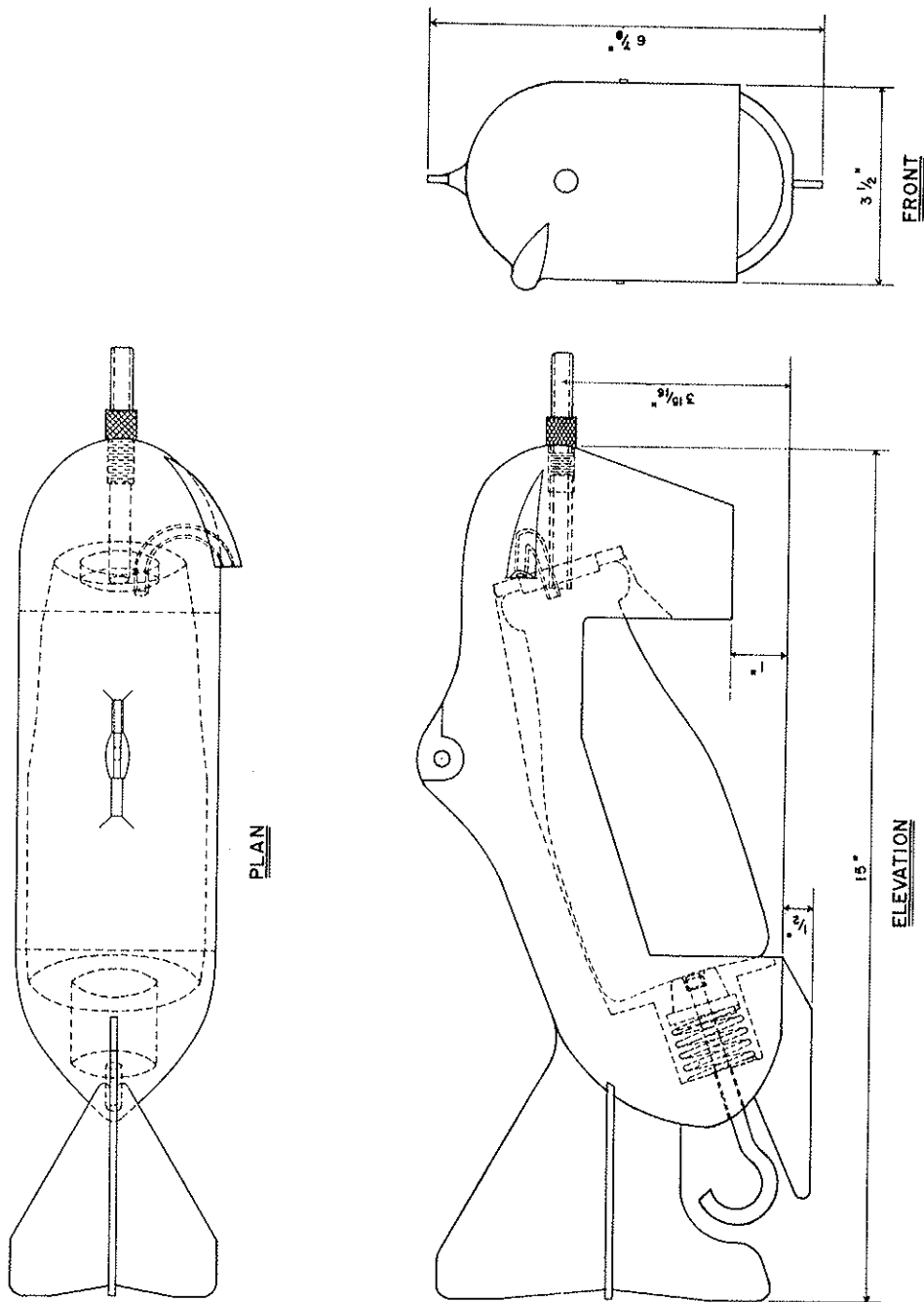
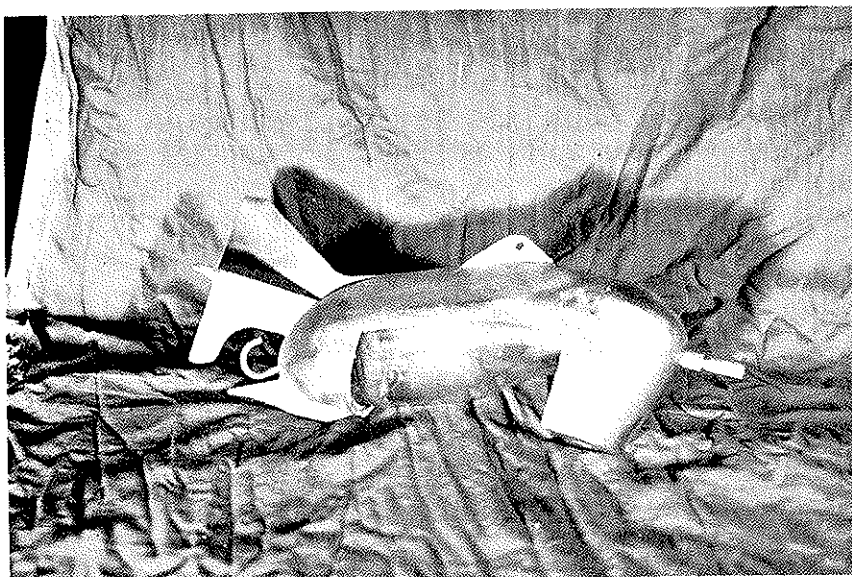


Figure 2. DEPTH-INTEGRATING SUSPENDED-SEDIMENT HAND-LINE SAMPLER, US DH-59



Shown with pint milk bottle in place.



Shown with pint milk bottle removed from
sampler body.

FIG. 3 -- DEPTH-INTEGRATING HAND-LINE SAMPLER, US DH-59

into the milk-bottle containers. The air in the milk bottle which is being displaced by the accumulated sample is ejected downstream through an air-exhaust tube cast integrally with the body casting and protected by a stream-lined projection alongside of the head of the sampler. The sampler is calibrated and supplied with nozzles having 1/4-inch, 3/16-inch and 1/8-inch bore. Sample container bottles and the suspension are not furnished with the hand-line suspended-sediment sampler. A photograph and drawing of the sampler are shown in figures 1 and 2.

In operation, a clean bottle for each sample is securely sealed within the body of the sampler. The appropriate nozzle is selected and seated in the threaded recess of the sampler head, and the sampler lowered and raised at a uniform rate between the water surface and the bottom of the stream. On contacting the stream bed the direction of travel is reversed instantly and the sampler raised at the same or some other uniform rate. This sampler continues to take its sample throughout the period of submergence and must be removed from the stream before the bottle has completely filled. Bottled samples are carefully removed from the sampler, properly capped and marked, and shipped to the laboratory for analysis.

Operating instructions for the sampler are given in Report O.

HYDRAULIC CHARACTERISTICS

Available nozzle sizes = 1/8", 3/16" and 1/4"
(0.32, 0.48 and 0.64 cm)
(red colored nozzle only)

Maximum allowable depth varies with nozzle and container sizes as follows:

<u>nozzle size</u>	<u>pint container</u>	<u>quart container</u>
1/8" (0.32 cm)	5.8 m (19 ft)	4.9 m (16 ft)
3/16" (0.48 cm)	4.9 m (16 ft)	4.9 m (16 ft)
1/4 " (0.64 cm)	2.7 m (8.9 ft)	4.9 m (16 ft)

Maximum calibrated velocity = 1.5 m/s (5 ft/s)
Distance between nozzle and sampler bottom =
114 mm (4.49 in)

—PHYSICAL CHARACTERISTICS—

Overall length (less nozzle) = 15" (38.1 cm)
Approximate width = 3 1/2" (8.89 cm)
Weight = 22 lbs. (10 kg)
Shipping weight = 32 lbs. (14.5 kg)

—SHIPPING INFORMATION—

Box dimensions = 19 1/2 x 9 1/4 x 6 in.
(49.5 x 23.5 x 15.2 cm)
Box volume = 0.63 ft³ (17,700 cm³)

Depth-integrating suspended-sediment sampler, US D-74

This is a 62-pound sampler for suspension by cable, reel, and crane to take suspended-sediment samples in streams not greater than 18 feet in depth.

The sampler has a cast bronze streamlined body 24-inches long, in which a round or square pint or quart bottle sample container (not furnished) is enclosed. The head of the sampler is hinged to permit access to the sample container. Tail vanes are provided to orient the instrument into the stream flow. The head of the sampler is drilled and tapped to receive the 1/4-inch, 3/16-inch or 1/8-inch intake nozzle which projects into the current for collecting the sample. A port which points downstream is provided on the side of the sampler head from which air escapes as it is displaced by the sample being collected in the container.

The instrument is suspended on a hanger bar attached to a 1/8-inch steel cable and is lowered and raised by means of a reel mounted on a crane. None of the equipment for suspension of the sampler is furnished. U.S. Geological Survey current meter hanger bar, reel, and crane are suitable for sediment sampler suspension. This instrument is generally operated from a bridge or cableway. Photographs of the sampler are shown in figures 1 and 2.

To obtain a sample, a bottle is inserted in the sampler and the instrument is lowered at a uniform rate from the water surface to the bottom of the stream, instantly reversed, and then raised again to the water surface at a uniform rate. The sampler continues to take its sample throughout the time of submergence. At least one sample should be taken at each vertical selected in the stream cross section. A clean bottle is used for each sample.

Information on the sampler also is available in Report No. 6. Operating instructions are given in Report O.

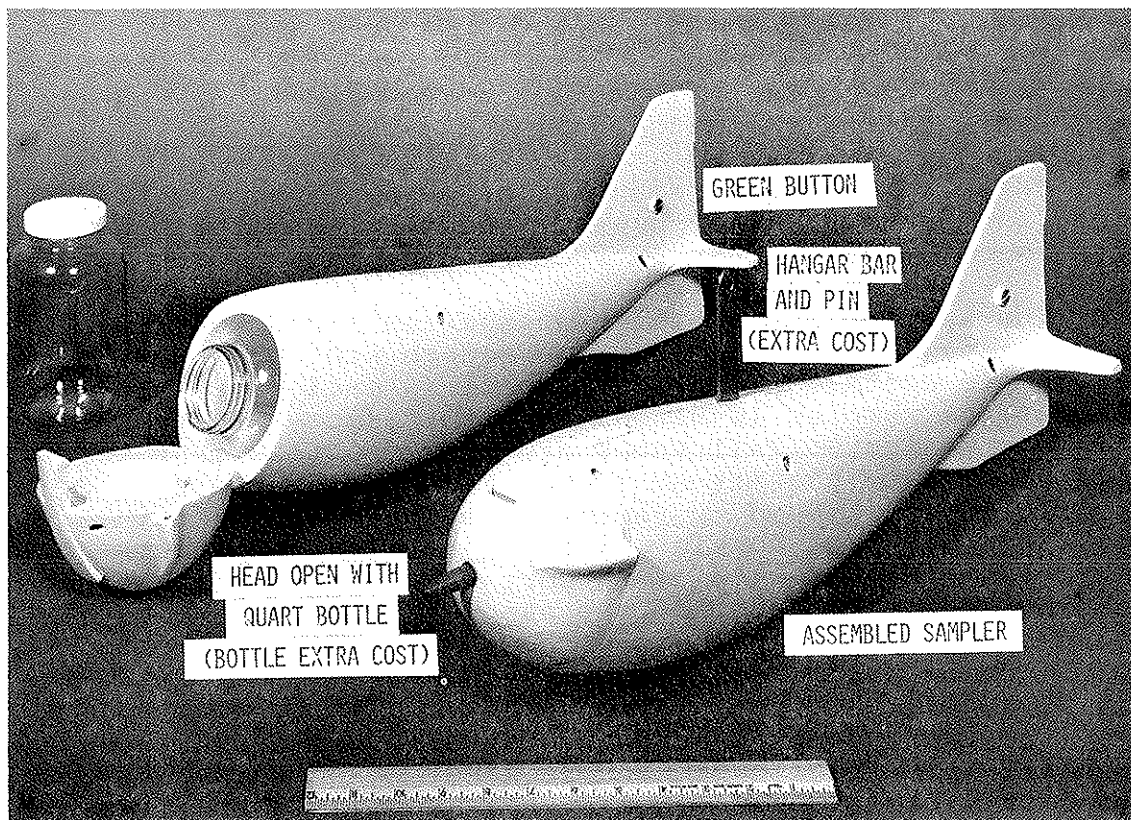


Figure 1. DEPTH-INTEGRATING SUSPENDED-SEDIMENT SAMPLER,
US D-74

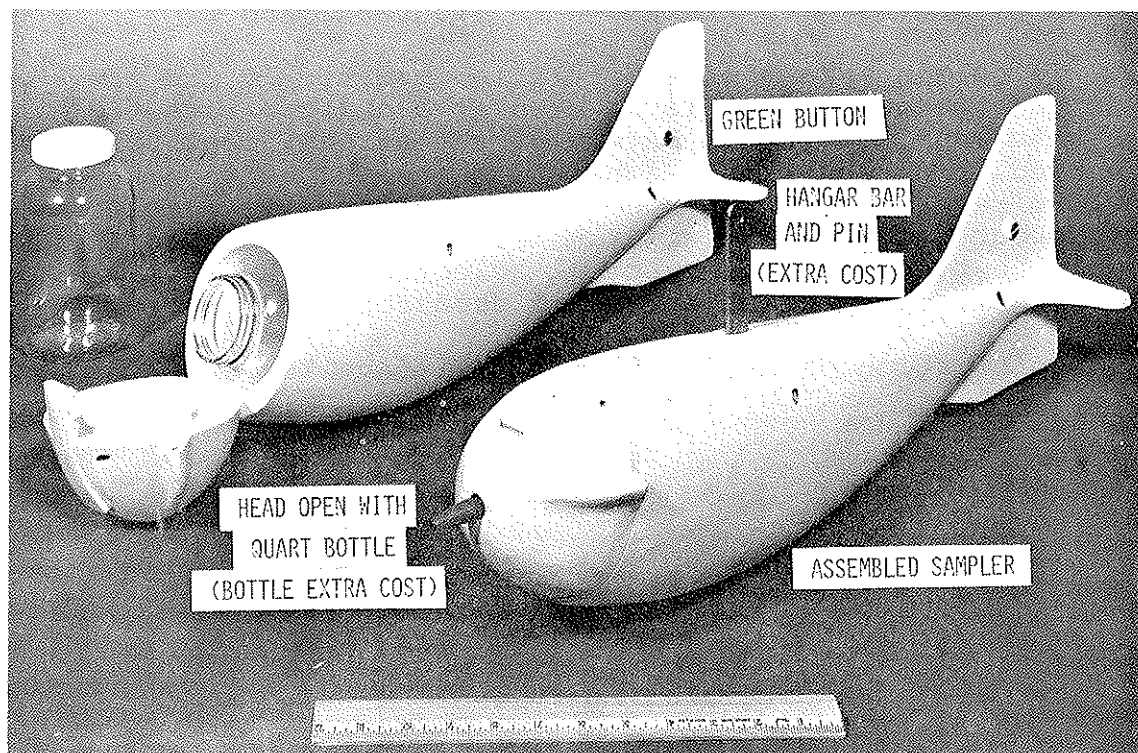


Figure 2. DEPTH-INTEGRATING SUSPENDED-SEDIMENT SAMPLER,
US D-74

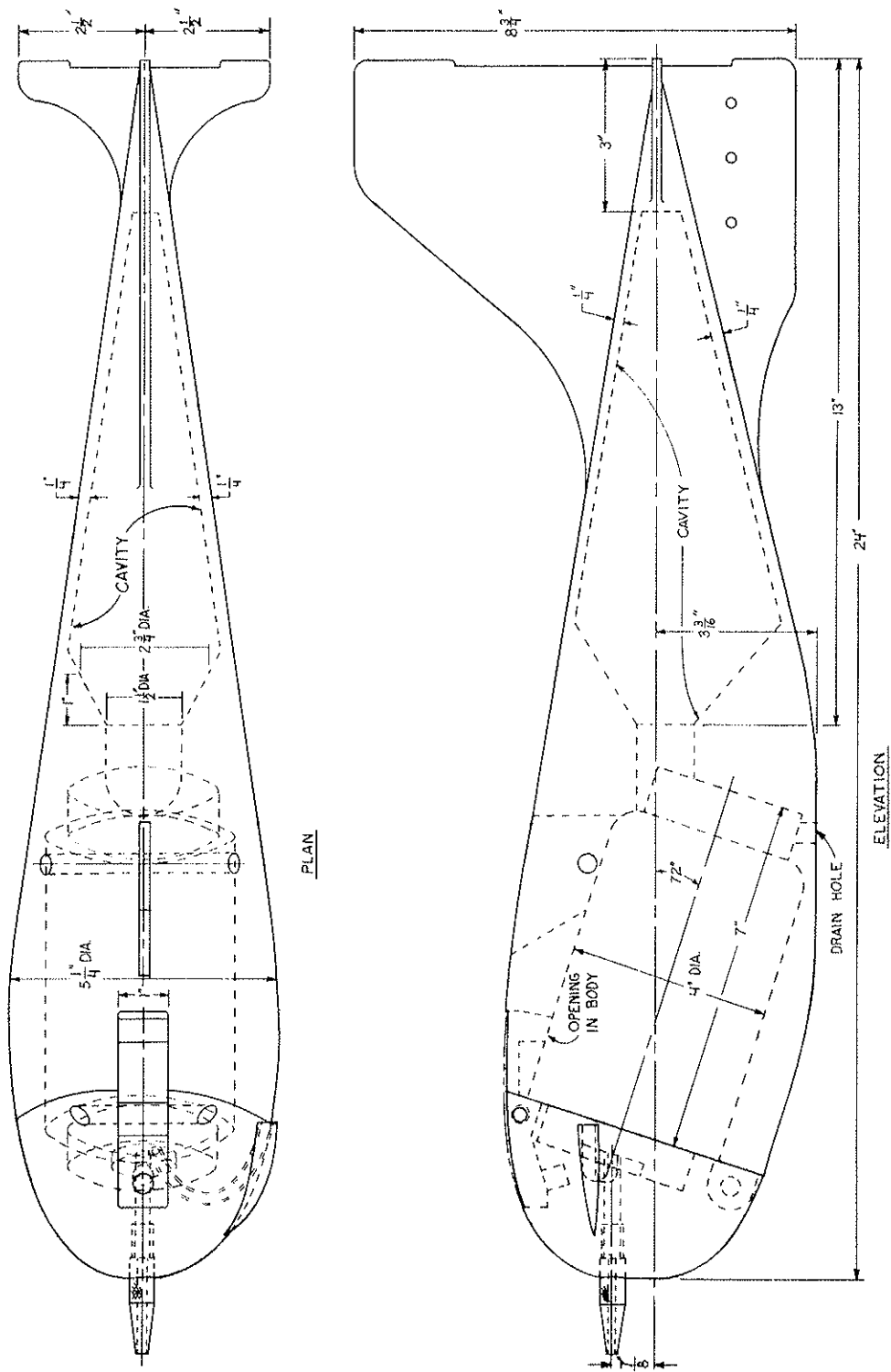


Figure 3. DEPTH-INTEGRATING SUSPENDED-SEDIMENT SAMPLER, US D-74

HYDRAULIC CHARACTERISTICS

Available nozzle sizes = 1/8", 3/16" and 1/4"
(0.32, 0.48 and 0.64 cm)
(green colored nozzle only)

Maximum allowable depth varies with nozzle and
container sizes as follows:

<u>nozzle size</u>	<u>pint container</u>	<u>quart container</u>
1/8"	5.8 m	4.9 m
(0.32 cm)	(19 ft)	(16 ft)
3/16"	4.9 m	4.9 m
(0.48 cm)	(16 ft)	(16 ft)
1/4"	2.7 m	4.9 m
(0.64 cm)	(8.9 ft)	(16 ft)

Maximum calibrated velocity = 2.0 m/s (6.6 ft/s)

D-74 Aluminum maximum calibrated velocity =

1.8 m/s (5.9 ft/s)

Distance between nozzle and sampler bottom =

103 mm (4.06 in)

D-74 Aluminum distance between nozzle and sampler
bottom = 111 mm (4.37 in)

PHYSICAL CHARACTERISTICS

Overall length (less nozzle) = 2 ft (61 cm)

Approximate width = 5 1/4" (13.3 cm)

Weight = 62 lbs. (28.1 kg)

Shipping weight = 80 lbs. (36.3 kg)

SHIPPING INFORMATION

Box dimensions = 28 1/2 x 7 1/4 x 10 3/4 in.
(72.4 x 18.4 x 27.3 cm)

Box volume = 1.29 ft³ (36,400 cm³)

Depth-integrating suspended-sediment hand-line sampler,
US DH-76

This is a medium-weight suspended-sediment sampler for attachment to a hand-line type of suspension. The sampler can be lowered and raised, hand-over-hand, with a flexible suspension line.

This sampler comprises a streamlined bronze casting, 15-inches long, which partially encloses a round quart-size glass milk bottle. To meet the requirements of certain types of chemical sampling applications special epoxy-coated DH-76's equipped with nylon nozzles and nozzle sleeves are available. Either sample weighs approximately 22 pounds and is equipped with a tail-vane assembly to orient the intake nozzle of the sampler into the approaching flow as the sampler enters the water. The glass-bottle sample container is sealed against a gasket in the head cavity of the casting by pressure applied to the base of

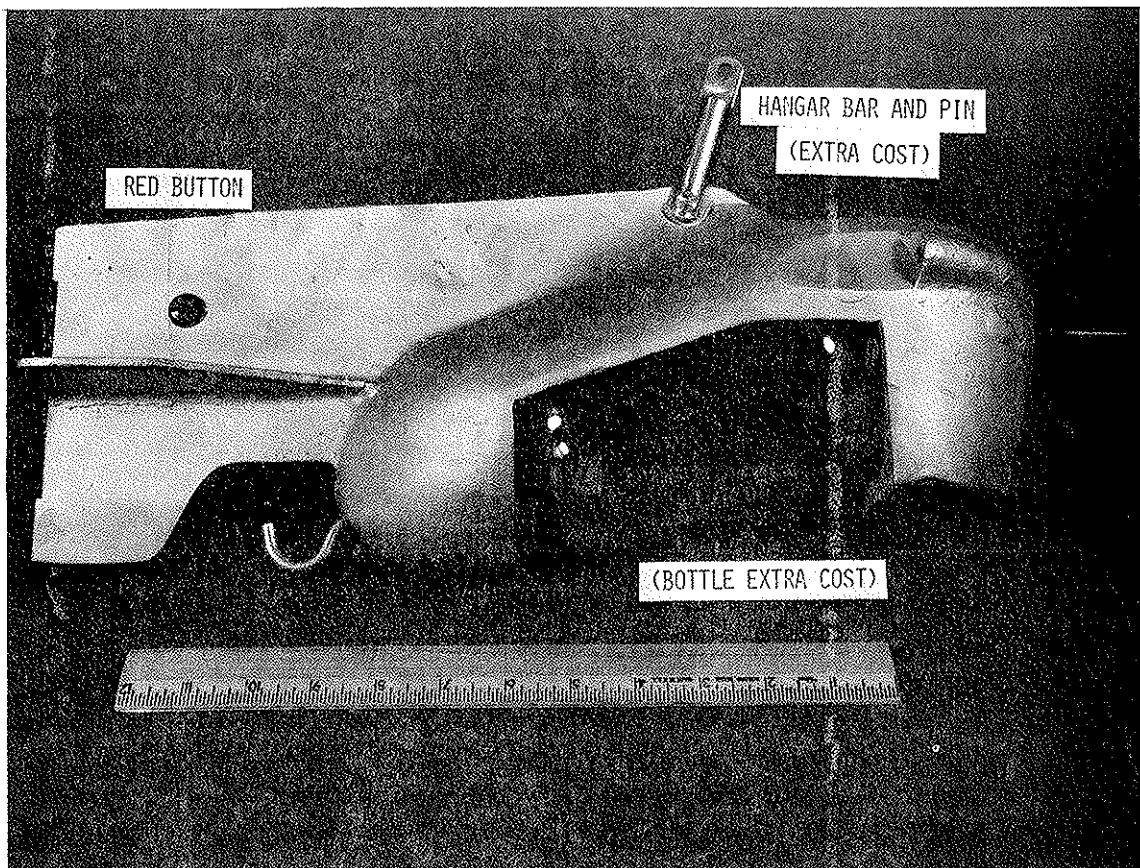


Figure 1. DEPTH-INTEGRATING SUSPENDED-SEDIMENT SAMPLER,
US DH-76

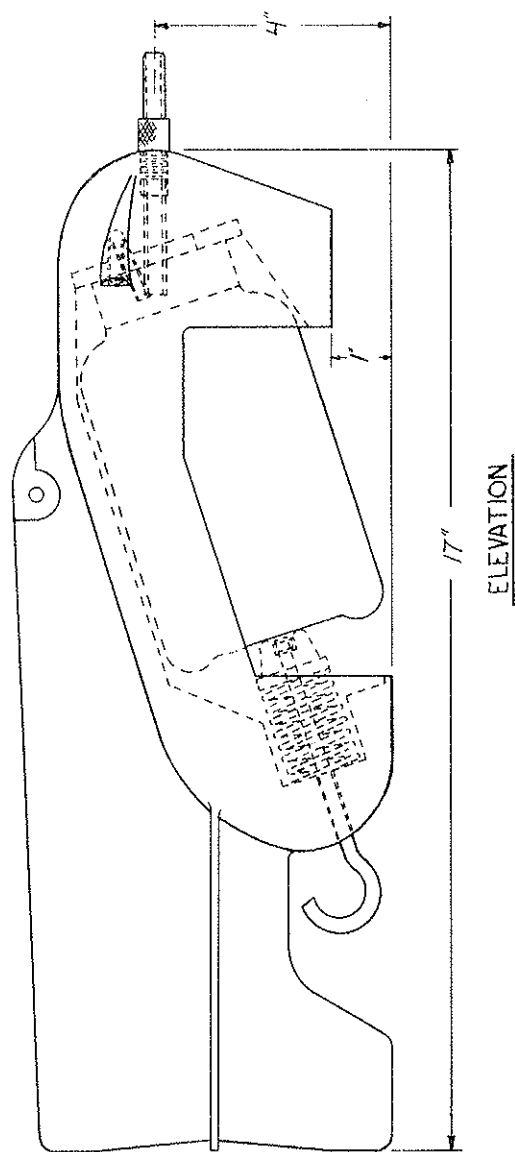
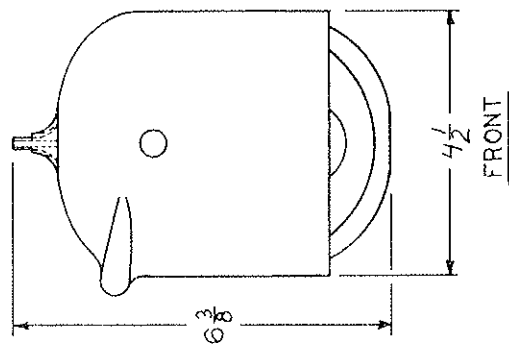
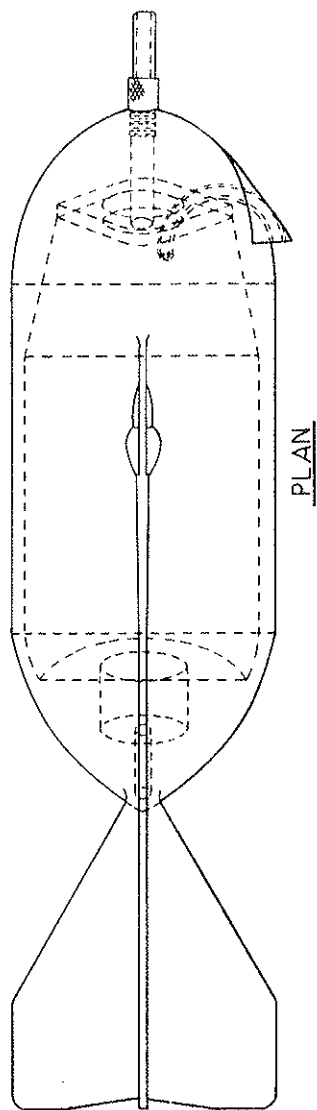


Figure 2. DEPTH-INTEGRATING SUSPENDED-SEDIMENT HAND-LINE SAMPLER, US DH-76

the bottle by hand-operated, spring-tensioned, pull-rod assembly at the tail of the sampler. Suspended-sediment samples, collected by the intake nozzle projecting horizontally upstream from the head of the casting, are discharged into the milk bottle containers. The air in the milk bottle which is being displaced by the accumulated sample is ejected downstream through an air exhaust tube cast integrally with the body casting and protected by a streamlined projection alongside of the head of the sampler. The sampler is calibrated and supplied with nozzles having 1/4-inch, 4/16-inch and 1/8-inch bore. Sample container bottles and the suspension are not furnished with the hand-line suspended-sediment sampler. A photograph of the sampler is shown in figure 1.

In operation, a clean bottle for each sample is securely sealed within the body of the sampler. The appropriate nozzle is selected and seated in the threaded recess of the sampler head, and the sampler lowered and raised at a uniform rate between the water surface and the bottom of the stream. On contacting the stream bed the direction of travel is reversed instantly and the sampler raised at the same or some other uniform rate. This sampler continues to take its sample throughout the period of submergence and must be removed from the stream before the bottle has completely filled. Bottled samples are carefully removed from the sampler, properly capped and marked, and shipped to the laboratory for analysis.

Operating instructions for the sampler are given in Report O.

HYDRAULIC CHARACTERISTICS

Available nozzle sizes = 1/8", 1/16" and 1/4"
(0.32, 0.48 and 0.64 cm)
(red colored nozzle only)

Maximum allowable depth varies with nozzle and
container sizes as follows:

nozzle size	pint container	quart container
1/8" (0.32 cm)	5.6 m (19 ft)	4.9 m (16 ft)
3/16" (0.48 cm)	4.9 m (16 ft)	4.9 m (16 ft)
1/4" (0.64 cm)	2.7 m (8.9 ft)	4.9 m (16 ft)

Maximum calibrated velocity = 2.0 m/s (6.6 ft/s)

Distance between nozzle and sampler bottom =
80 mm (3.15 in)

PHYSICAL CHARACTERISTICS

Overall length (less nozzle) = 17" (43.2 cm)

Approximate width = 4 1/2" (11.4 cm)

Weight = 25 lbs. (11.3 kg)

Shipping weight = 37 lbs. (16.8 kg)

SHIPPING INFORMATION

Box dimensions = 22 1/4 x 9 x 7 in.

(56.5 x 22.9 x 17.8 cm)

Box volume = 0.81 ft³ (23,000 cm³)

Depth-integrating suspended-sediment wading-type sampler,
US D-77

The D-77 sampler was designed to collect large-volume, depth-integrated samples from streams at near-freezing temperatures. Several features were incorporated to minimize the possibility of biological and chemical contamination of the sample. All components that contact the sample are of autoclavable plastic. Before and after collection, the sample container, sampling nozzle, and cap can be sealed and transported as a unit. To facilitate extensive chemical, biological, and sediment analysis, the sampler will collect a large volume, up to 2700 ml. Because each sample is collected with a fresh nozzle cap and container, water that may freeze in the nozzle or air exhaust need not be thawed before additional samples can be collected. Sampling through ice cover is made easier by the short 74-cm (29 inches) length and 23-cm (9 inches) width.

To collect a true discharge-weighted sample, the flow velocity in the nozzle should equal the stream velocity near the upstream end of the nozzle. If the flow velocity in the nozzle differs from the stream velocity by less than 15%, the errors in sediment concentration will be less than 5% at that point in the sampling vertical. At stream velocities less than 30 cm/sec (1 fps), sampling rates are significantly higher than stream velocity. This facilitates sample collection in slack water and sampling errors will be small because the suspended particles will have low fall velocities.

The bronze D-77 should sample with acceptable accuracy through stream velocities ranging from zero up to 220 cm/sec (7.2 fps). The aluminum sampler is light in weight and is unstable in velocities exceeding approximately 100 cm/sec (3.3 fps). Photographs of the sampler are shown in figures 1 and 2.

Based on characteristics of other suspended-sediment samplers the nozzle velocities of the D-77 will increase with an increase in water temperature. That is to say, the curve will be shifted upwards with warmer temperatures.

An instruction manual is furnished with each sampler and discusses sampling technique. A sampling bottle, a nozzle and cap are also provided.

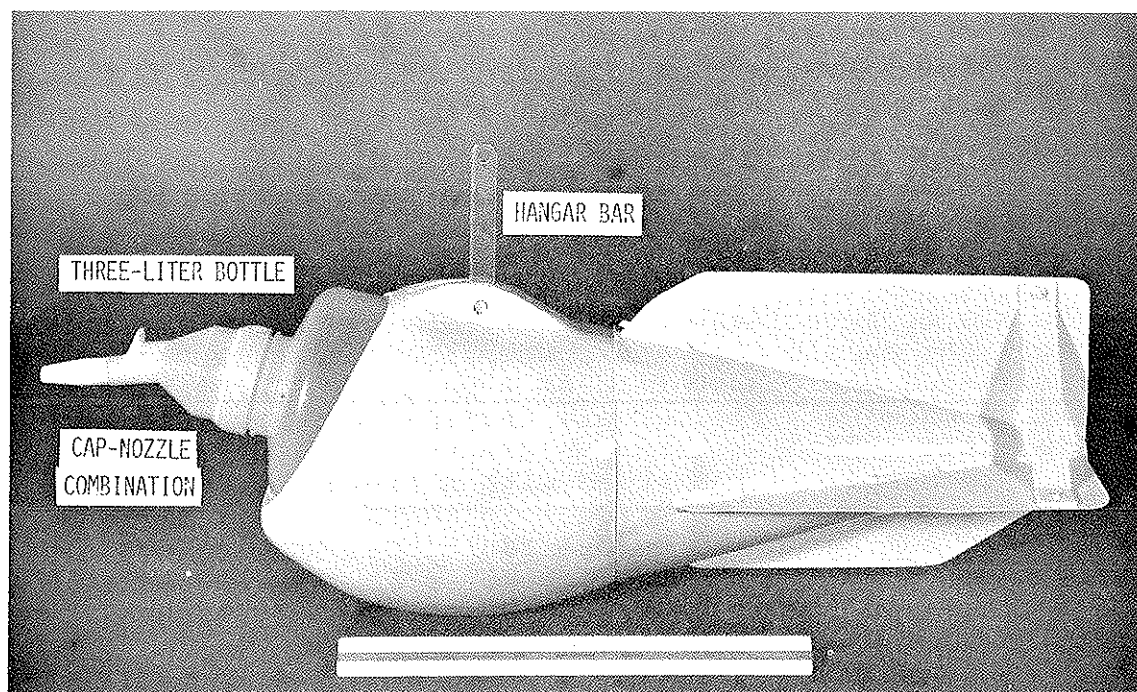


Figure 1. FULLY ASSEMBLED DEPTH-INTEGRATING SUSPENDED-SEDIMENT WADING-TYPE SAMPLER, US D-77

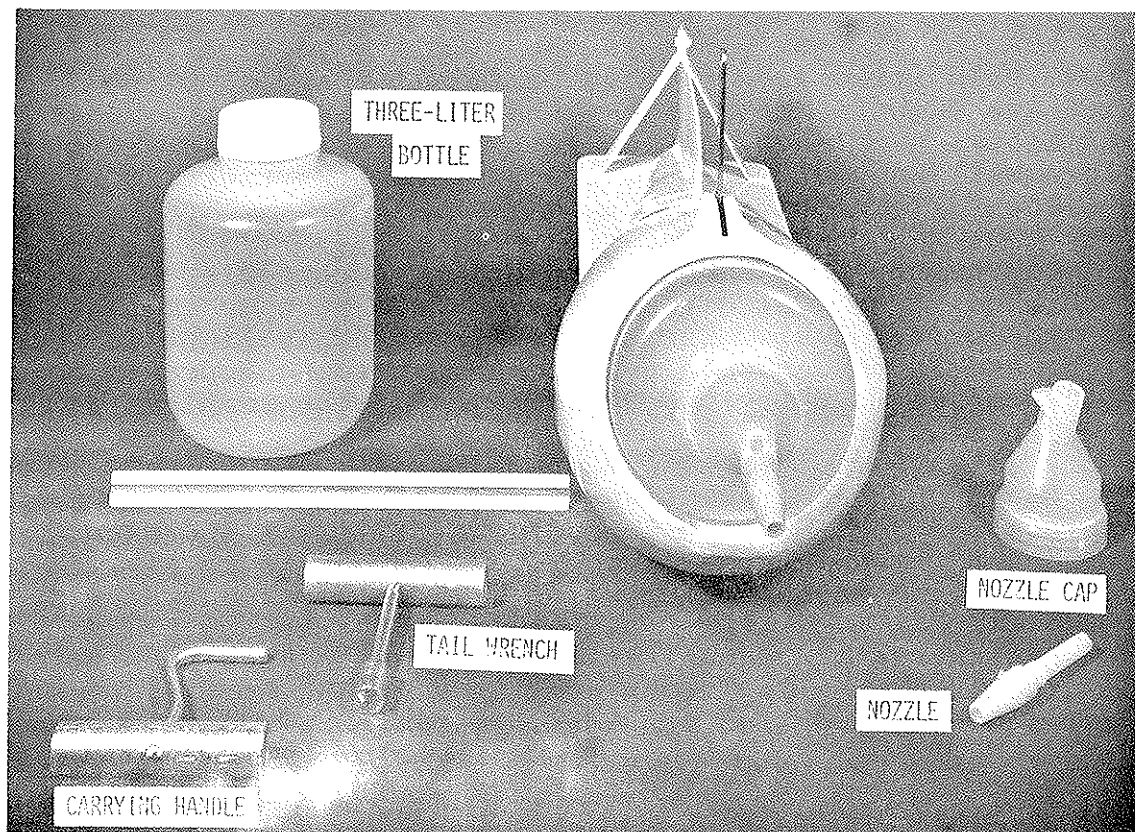


Figure 2. DEPTH-INTEGRATING SUSPENDED-SEDIMENT WADING-TYPE SAMPLER, US D-77, WITH ACCESSORIES

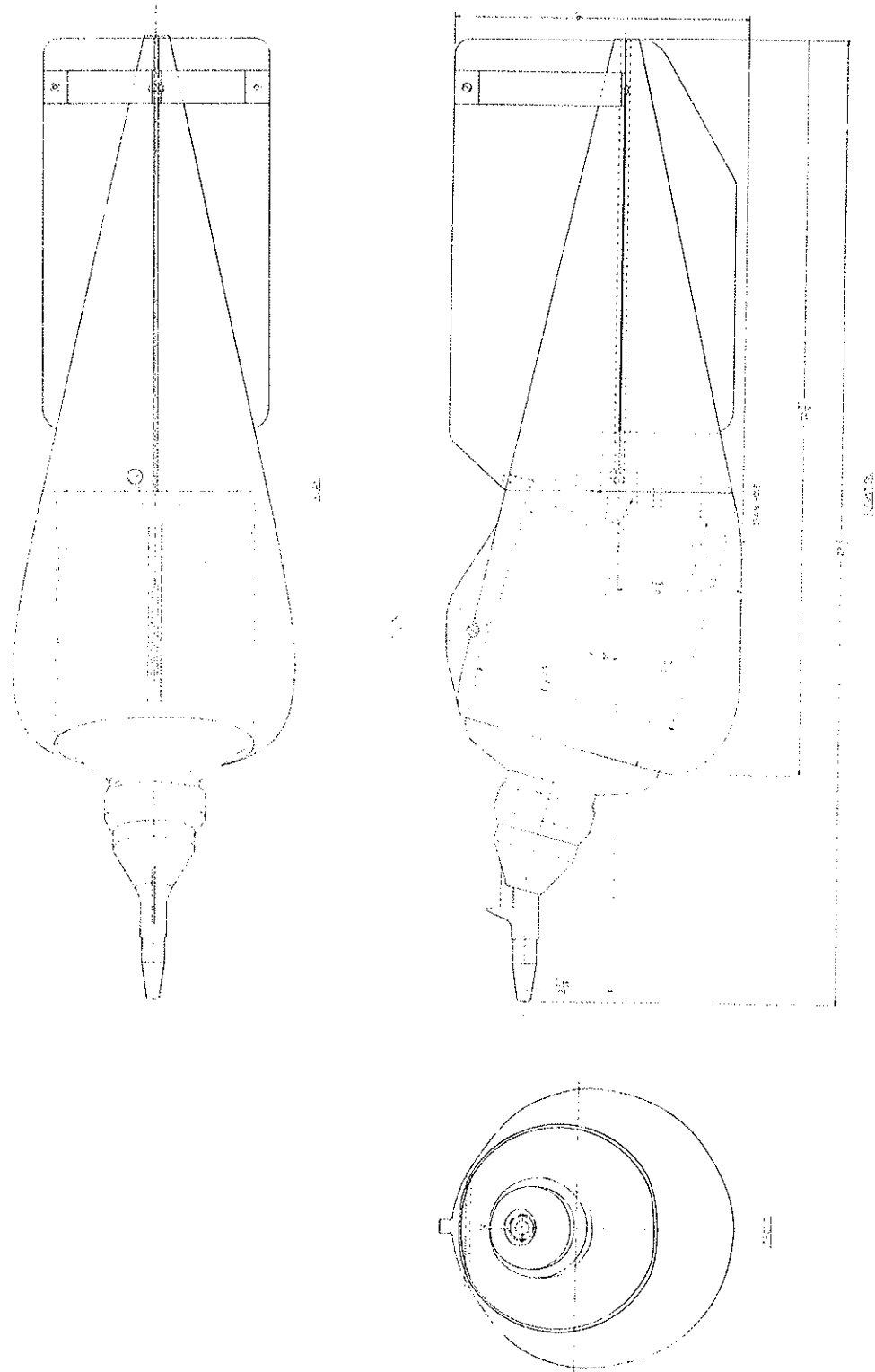


Figure 3. DEPTH-INTEGRATING SUSPENDED-SEDIMENT WADING-TYPE SAMPLER, US D-77

—HYDRAULIC CHARACTERISTICS—

Available nozzle size = 5/16" (0.79 cm)
(natural colored nozzle only)
Maximum allowable depth = 4.72 m (15.5 ft)
Maximum calibrated velocity = 2.4 m/s (8 ft/s)
Distance between nozzle and sampler bottom =
177 mm (7 in)

—PHYSICAL CHARACTERISTICS—

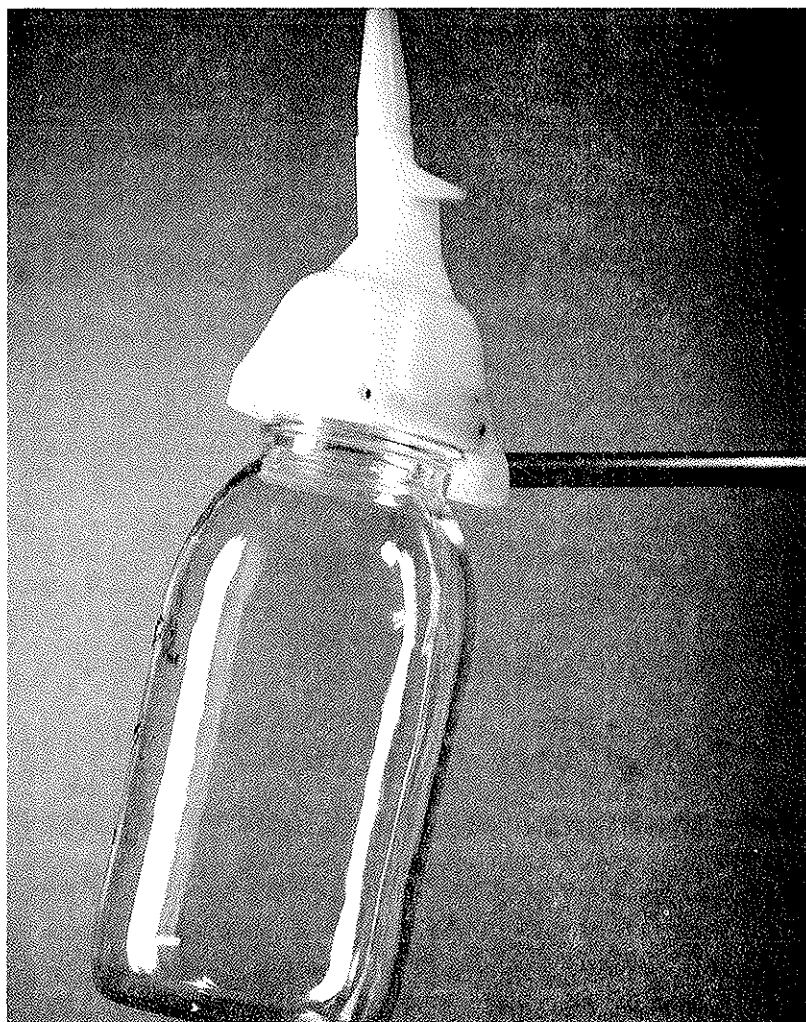
Overall length (with nozzle) = 2' 5 1/2" (74.9 cm)
Approximate width = 9" (22.9 cm)
Weight = 75 lbs. (34.02 kg)
Shipping weight = 112 lbs. (50.8 kg)

—SHIPPING INFORMATION—

Box dimensions = 34 x 13 1/2 x 13 1/2 in.
(86.4 x 34.3 x 34.3 cm)
Box volume = 3.6 ft³ (1.10 m³)

US DH-81 Adapter

The DH-81 adapter is a device that holds the D-77 cap and any container that has a mason-jar thread. After adding a nozzle and wading rod, the hydrologist has a hand-held depth-integrating sampler. Containers are available from one pint to three liter in glass or plastic. Nozzles are available in 1/8, 3/16, 1/4, and 5/16-inch diameter sizes.



—PHYSICAL CHARACTERISTICS—

Overall length	=	2 1/8"	(5.4 cm)
Approximate width	=	4 3/8"	(11.11 cm)
Weight	=	2 ounces	(57 gms)
Shipping weight	=	1 pound	(456 gms)

Figure 1. US D-77 CAP AND NOZZLE, QUART BOTTLE, WADING ROD, AND US DH-81 ADAPTER

Wading rods

These rods are designed for holding the hand-held suspended-sediment samplers.

The rods are made from 1/2-inch diameter stainless steel and have a "standard" 7/16-inch x 20 N.F. threaded bottom. They are marked every foot and have a plastic grip.

The 3-foot rod, with plastic grip, will satisfy most requirements, but extra length can be added using separate 1-foot or 3-foot sections. A photograph of the wading rods is shown in figure 1.

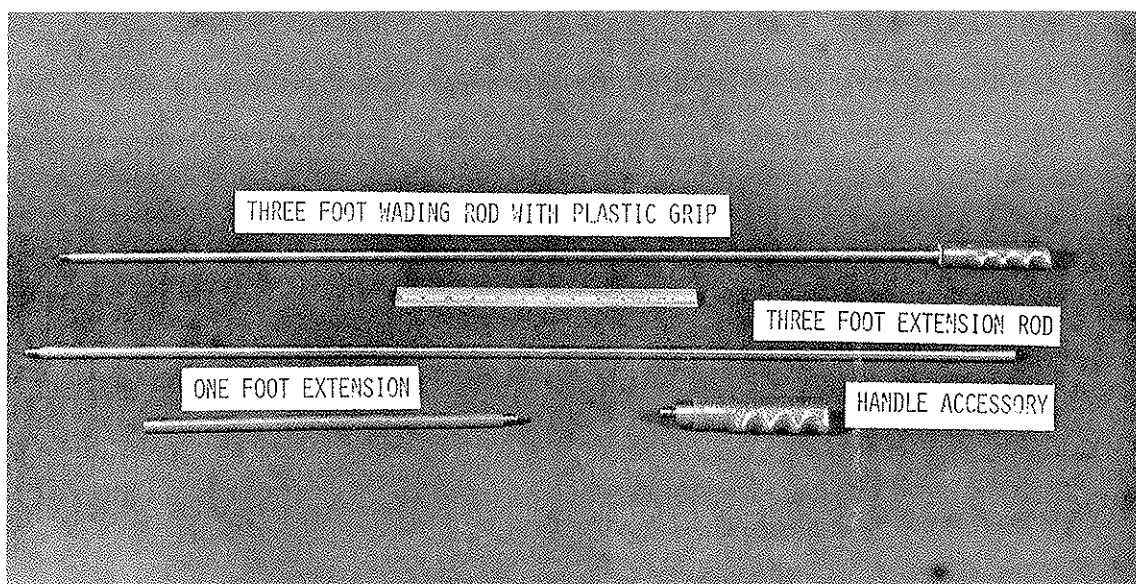


Figure 1. WADING RODS

PHYSICAL CHARACTERISTICS

Weights:

3-foot wading rod with plastic grip = 3 lbs (1.4 kg)

3-foot wading rod extension (without plastic grip) =
3 1/4 lbs (1.5 kg)

1-foot wading rod extension = 1 lb (0.45 kg)

Plastic grip = 1/4 lb (0.11 kg)

(add 1 lb. for shipping weight)

Dimensions:

Wading rods = 1/2" dia. (1.27 cm)

Handle = 4 3/4" (12 cm) long x 1 3/8" dia. (3.51 cm)

SHIPPING INFORMATION

Box dimensions = 42 1/2 x 2 1/4 in. (tube)
(107.95 x 5.72 cm)

Box volume = 0.1 ft³ (2,770 cm³)

Point-integrating suspended-sediment sampler, US P-61

The US P-61 is a 105-pound sampler having an electrically-operated valve for collection of a suspended-sediment sample at any point in a stream cross section or to take a depth-integrated sample over a range of depth.

This is a cast bronze sampler, 28-inches long. It is streamlined and has tail vanes to orient the sampler so that the intake nozzle in the head points directly into the approaching flow. The sampler head is hinged to provide access to the round pint or quart milk bottle sample container (not furnished) which is located in a cavity in the sampler body. When the head is closed onto the body, the sample container is sealed in place. An exhaust port pointing downstream on the side of the sampler head permits escape of air from the bottle as it is displaced by the sample being collected. A valve mechanism enclosed in the head of the sampler is electrically activated to start and stop the sampling process. The valve operating switch is located at the observer's station on the bridge or cableway. Photographs and diagrams of the P-61 are shown in figures 1, 2, 3 and 4.

To eliminate sudden inrush at a selected sampling point below the water surface, the diving bell principle is used to balance the air pressure in the bottle with the hydrostatic pressure at the nozzle prior to opening the valve at the start of sampling. The bell in this case is the body cavity behind and surrounding the sample container. It is connected by ports through the valve system to the surrounding stream and to the sample bottle.

The sampler is supported by a hanger bar attached to a 1/8-inch steel two-conductor electrical suspension cable wound on a reel mounted on a crane (none of which are furnished). The electrical circuit in the suspension cable is for operation of the sampler valve. The equipment is operated from a bridge or cableway.

In the US P-61-A1, sampling is controlled by a two-position valve. The valve is held in the first position by a spring. When a rotary solenoid is actuated electrically, the valve moves into the sampling position. In the first position the passage is opened from the pressure chamber in the sampler body to the sample container so that the air in the sample container is at the same pressure as the water at the end of the intake nozzle. In the sampling position the intake passage is opened into the sample container, the connection to the pressure chamber is closed,

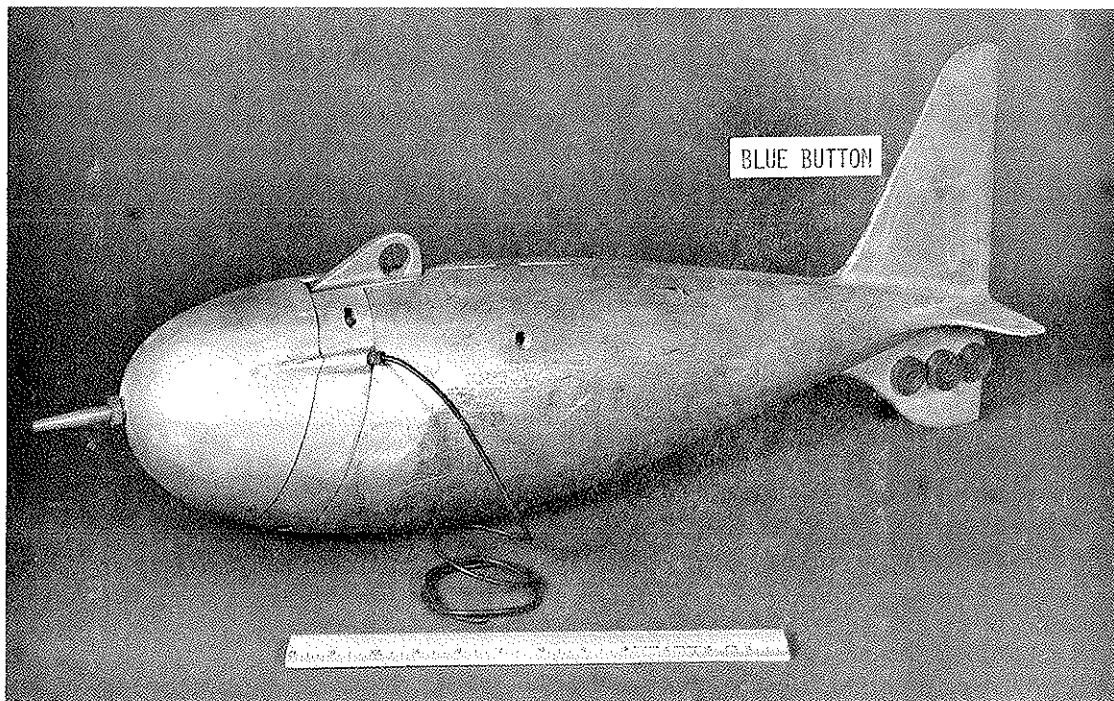


Figure 1. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER,
US P-61

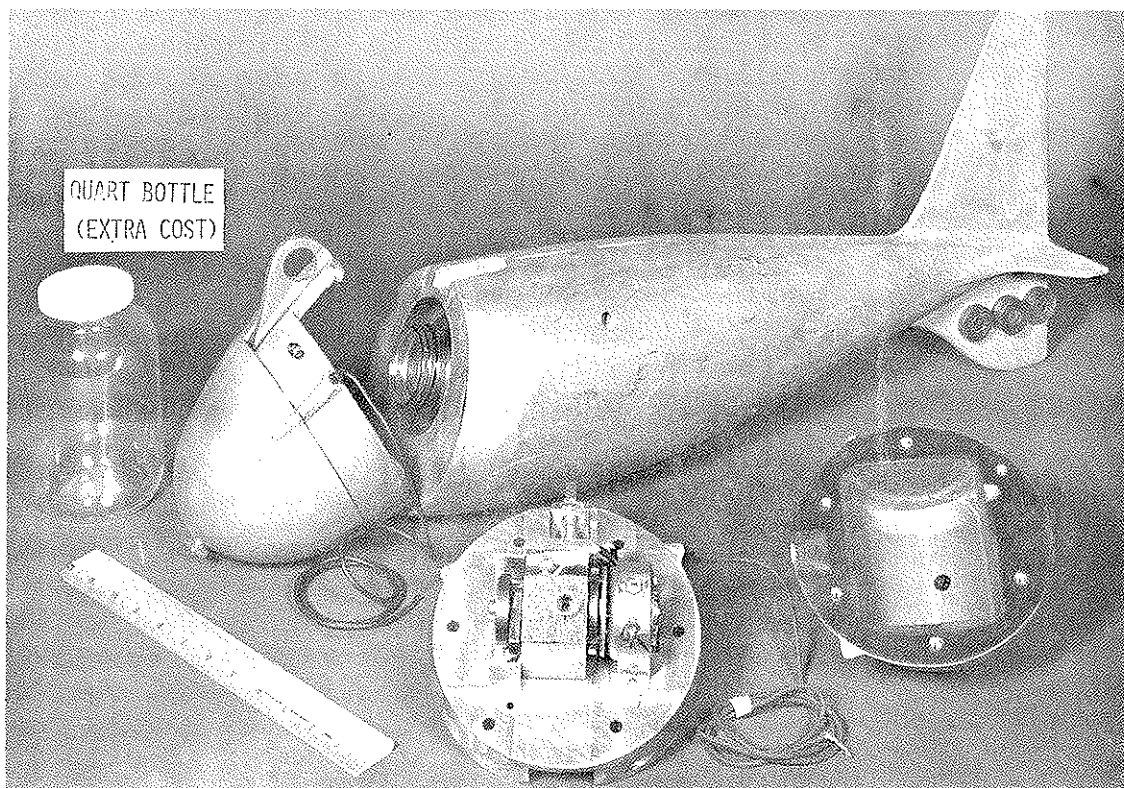


Figure 2. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER,
US P-61

and the air exhaust passage is open from the sample container to the exhaust port on the side of the sampler head.

The operating current may be supplied by lantern, hot-shot, or storage batteries connected in series to produce about 48 volts of direct current. (If the suspension cable is longer than 100 feet, a higher voltage may be desirable.) The electrical circuit to the solenoid is completed by connecting one battery terminal through the inner core to the solenoid. The solenoid is grounded in the sampler, and the ground circuit is completed through the outside of the suspension cable to the opposite terminal of the battery. The sampler takes a sample while the circuit is closed. Sampling ceases when the circuit is opened.

The BP-76, an accessory battery pack (not furnished), is described elsewhere. It contains two batteries, a large capacitor, a charge meter, and switch.

To obtain a suspended-sediment sample at any point beneath the surface of a stream, called point-integrating method, the sampler is lowered to the sampling point with the valve in the equalizing and closed position. When the sampler reaches the sampling point, the operator manipulates and holds the electrical switch to set the valve in the sampling position. At the end of the sampling time, the operator permits the valve to close by releasing the switch, raises the sampler out of the stream and removes the sample container. A clean bottle is required for each sample. The capacity of the equalizing chamber will permit sampling to a depth of about 180 feet.

The sampler may be used to obtain a sample continuously over a range in depth, called depth-integrating method. If the stream is not over 18 feet in depth with moderate velocity, the sampler valve is electrically held in the open position and the sample is obtained by lowering the sampler at a uniform rate from the water surface to the bottom of the stream, instantly reversing it, and raising the sampler to the water surface again at a uniform rate.

If the stream is between 18 and 30 feet deep, or has a high velocity, the sampler may be used to depth-integrate in one direction, i.e., from the bottom of the stream to the surface. The sampler valve is set in the equalizing position and the sampler is lowered to the stream bed. The valve is then opened to the sampling position by holding the electrical switch closed and the sampler is immediately raised to the surface at a uniform rate.

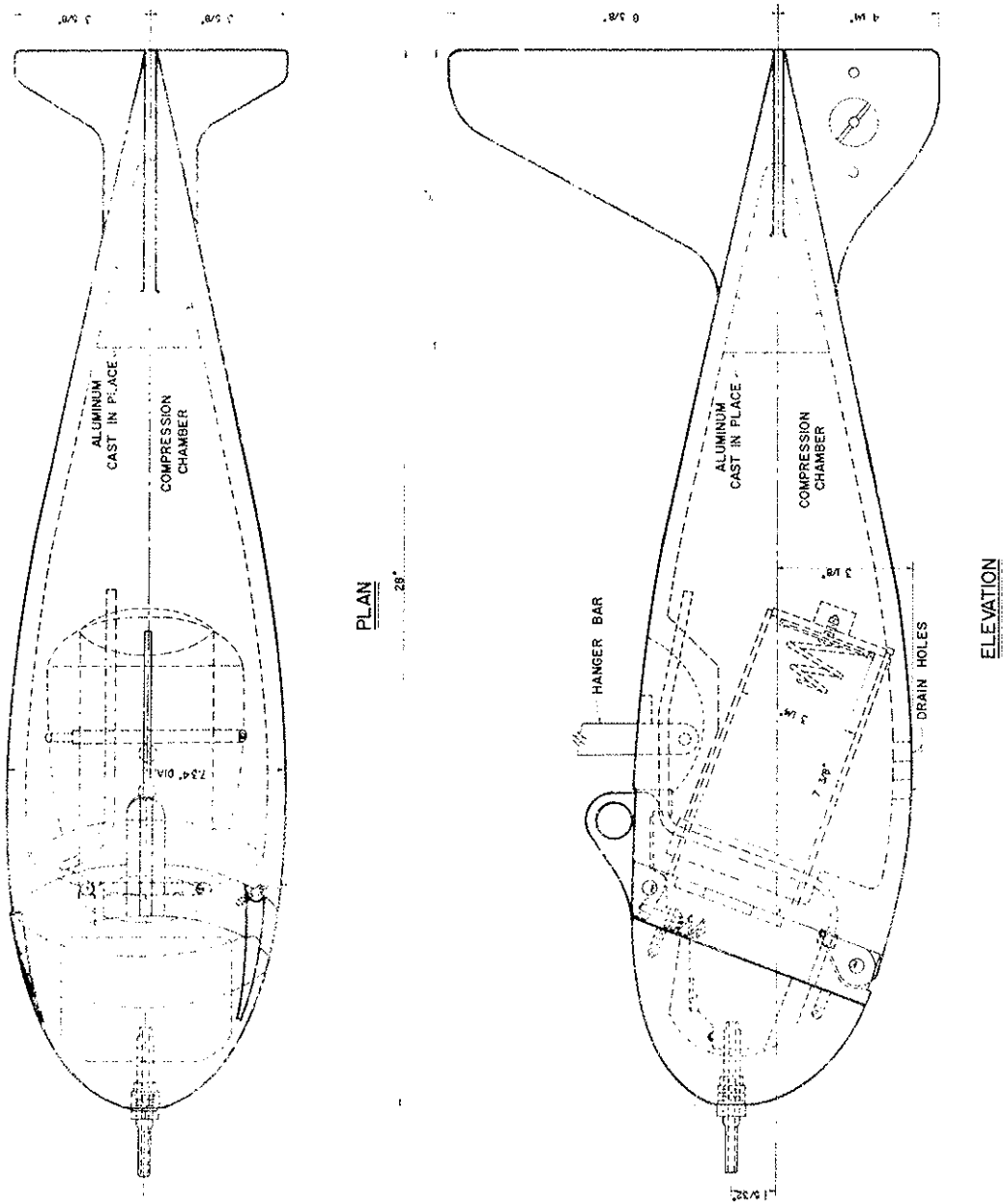


Figure 3. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER, US P-61-A1

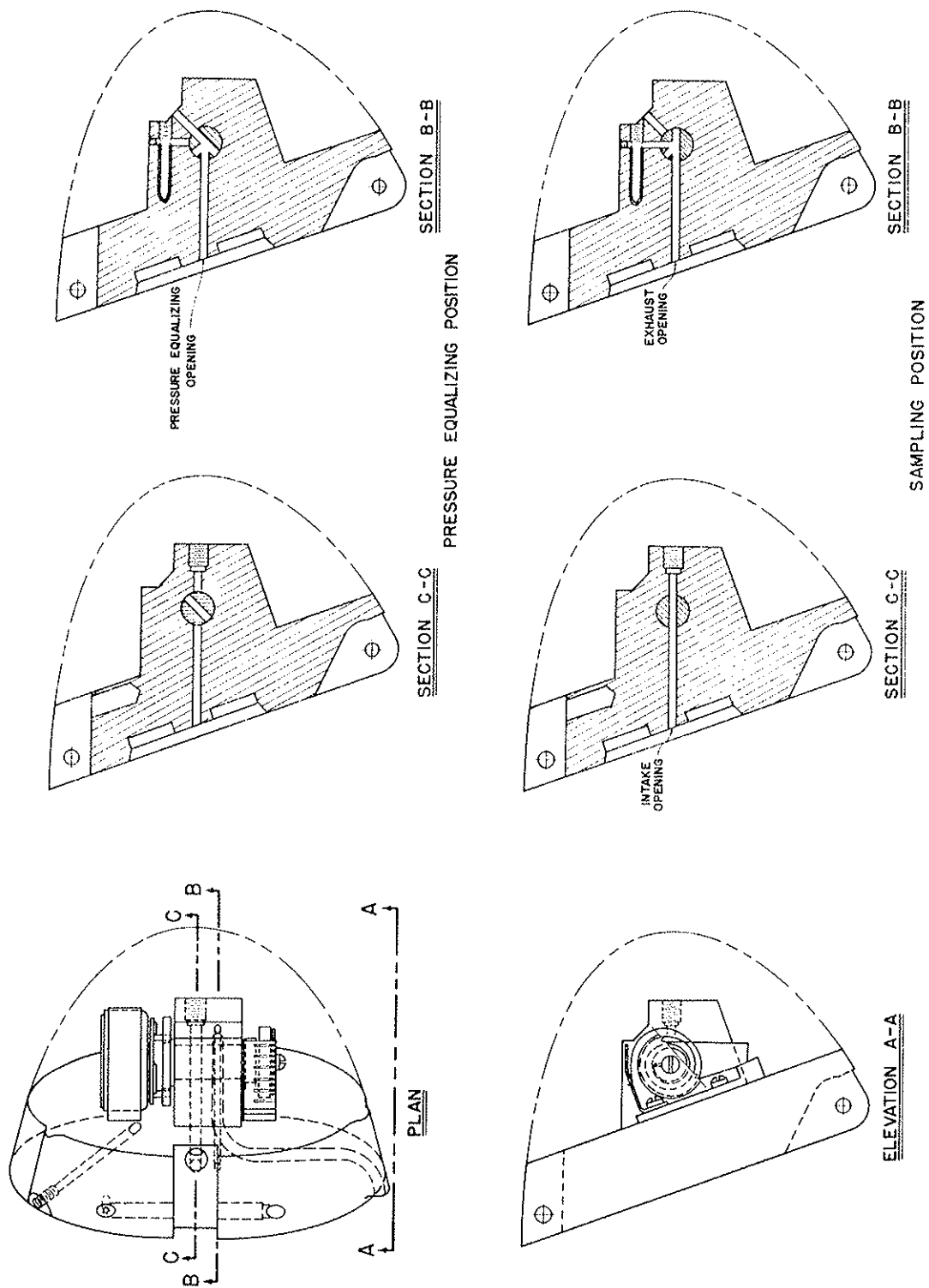


Figure 4. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER, US P-61-A1 VALVE MECHANISM

Streams which are too deep or flow too fast to be depth-integrated by either of the above methods may be sampled by dividing the vertical into fractions each of which is depth-integrated individually.

The sampler is supplied with two nylon nozzles and can be provided with teflon bushings to minimize contact between sample water and metal surfaces.

An operation manual is available upon request. Spare parts are also furnished.

—HYDRAULIC CHARACTERISTICS—

Available nozzle size = 3/16" (0.48 cm)

(blue colored nozzle only)

Maximum allowable depth varies with container size as follows:

<u>nozzle size</u>	<u>pint container</u>	<u>quart container</u>
3/16" (0.48 cm)	180 ft (54.9 m)	120 ft (36.6 m)

Maximum calibrated velocity = 2.0 m/s (6.6 ft/s)

Distance between nozzle and sampler bottom =
109 mm (4.29 in)

—PHYSICAL CHARACTERISTICS—

Overall length (less nozzle) = 28" (71.1 cm)

Approximate width = 7.34" dia. (18.6 cm)

Weight = 107 lbs. (48.5 kg)

Shipping weight = 149 lbs. (67.6 kg)

—SHIPPING INFORMATION—

Box dimensions = 34 1/2 x 13 3/4 x 16 in.

(87.6 x 34.9 x 40.6 cm)

Box volume = 4.4 ft³ (1.34 m³)

Point-integrating suspended-sediment sampler, US P-63

The US P-63 is a 200-pound electrically-operated suspended-sediment sampler that can be used to take a sample at any point in a stream cross section or to take a depth-integrated sample over a range of depth. The operating mechanism in the US P-63 is like that in the US P-61. The samplers differ mainly in size, weight, and in the capacity of the sample container that can be used. Because it weighs more than the US P-61-A1, it is better adapted to very great depths and high velocities.

The US P-63 is a cast bronze sampler, 37 inches long. It is streamlined and has tail vanes to orient the sampler so that the intake nozzle points directly into the approaching flow. See figure 3. The sampler container (not furnished) is usually a quart-size round milk bottle. An adapter is furnished so that a round pint milk bottle can be used. The maximum sampling depth is about 180 feet with a pint sample container and 120 feet with a quart container. The sampler head, which contains the electrically operated sampling mechanism, is hinged to the body at the bottom. The sample container is sealed in place when the head is closed onto the body. There is a pressure chamber in the sampler body. The air in the pressure chamber is at the static pressure corresponding to the depth of submergence.

In the US P-63, sampling is controlled by a two-position valve. See figure 4. The valve is held in the first position by a spring. When a rotary solenoid is actuated electrically the valve moves into the sampling position. In the first position the intake passage from the intake nozzle to the sample container is closed and direct connection is made from the pressure chamber in the sampler body to the sample container so that the air in the sample container is at the same pressure as the water at the outer end of the intake nozzle. In the sampling position the intake passage is open into the sample container, the connection to the pressure chamber is closed, and the air exhaust passage is open from the sample container to the exhaust port on the side of the sampler head. Photographs shown in figures 1 and 2.

The US P-63 sampler is designed for suspension on a steel cable that has an inner conductor core that is insulated to transmit electrical energy from the operating rig to the solenoid in the sampler head. The operating current may be supplied by lantern, hotshot, or storage batteries connected in series to produce about 48 volts of direct current. (If the suspension cable is longer than 100 feet, a higher voltage may be desirable.) The solenoid is grounded in the sampler, and ground circuit is completed through the outside

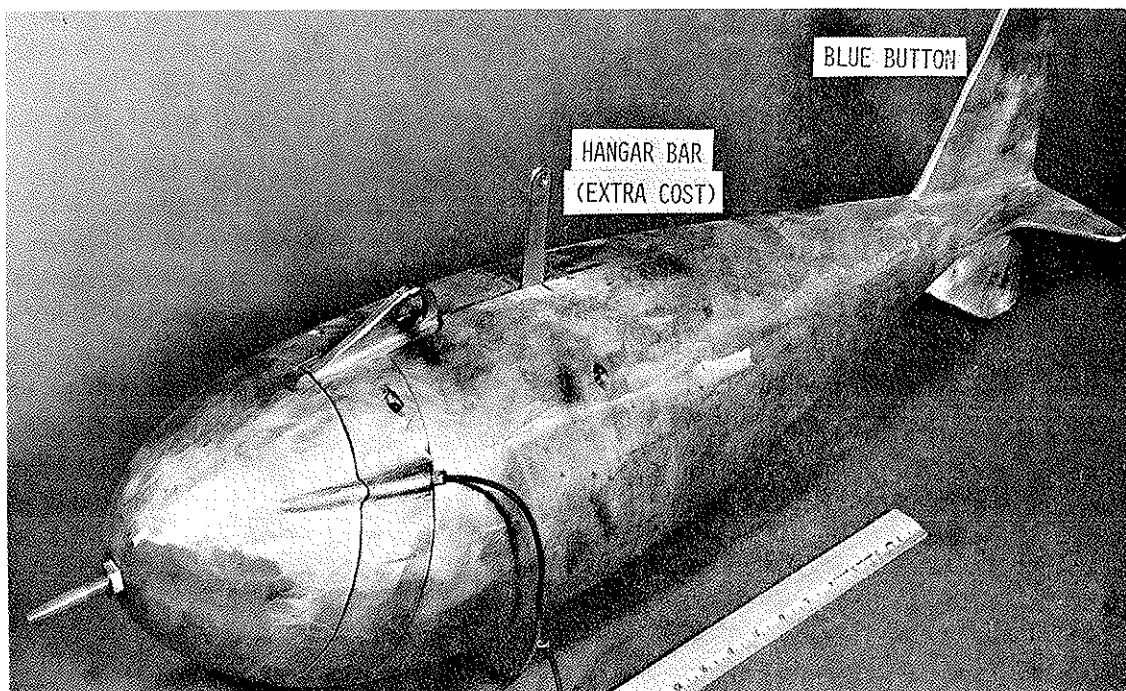


Figure 1. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER,
US P-63

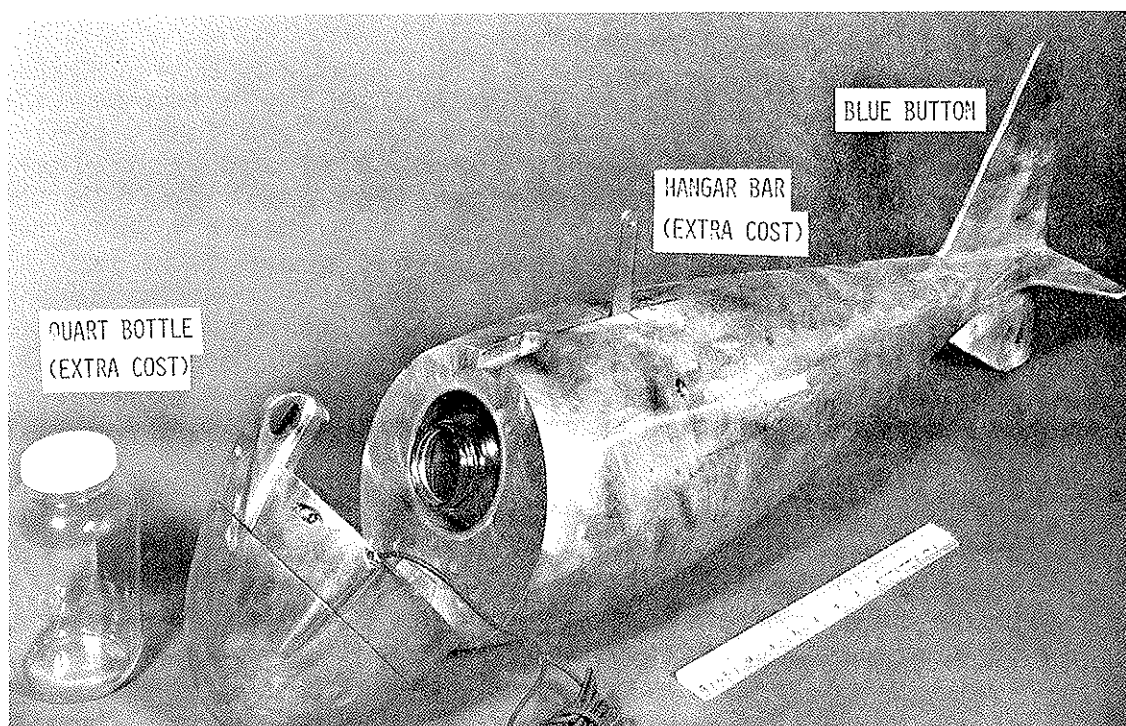


Figure 2. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER,
US P-63

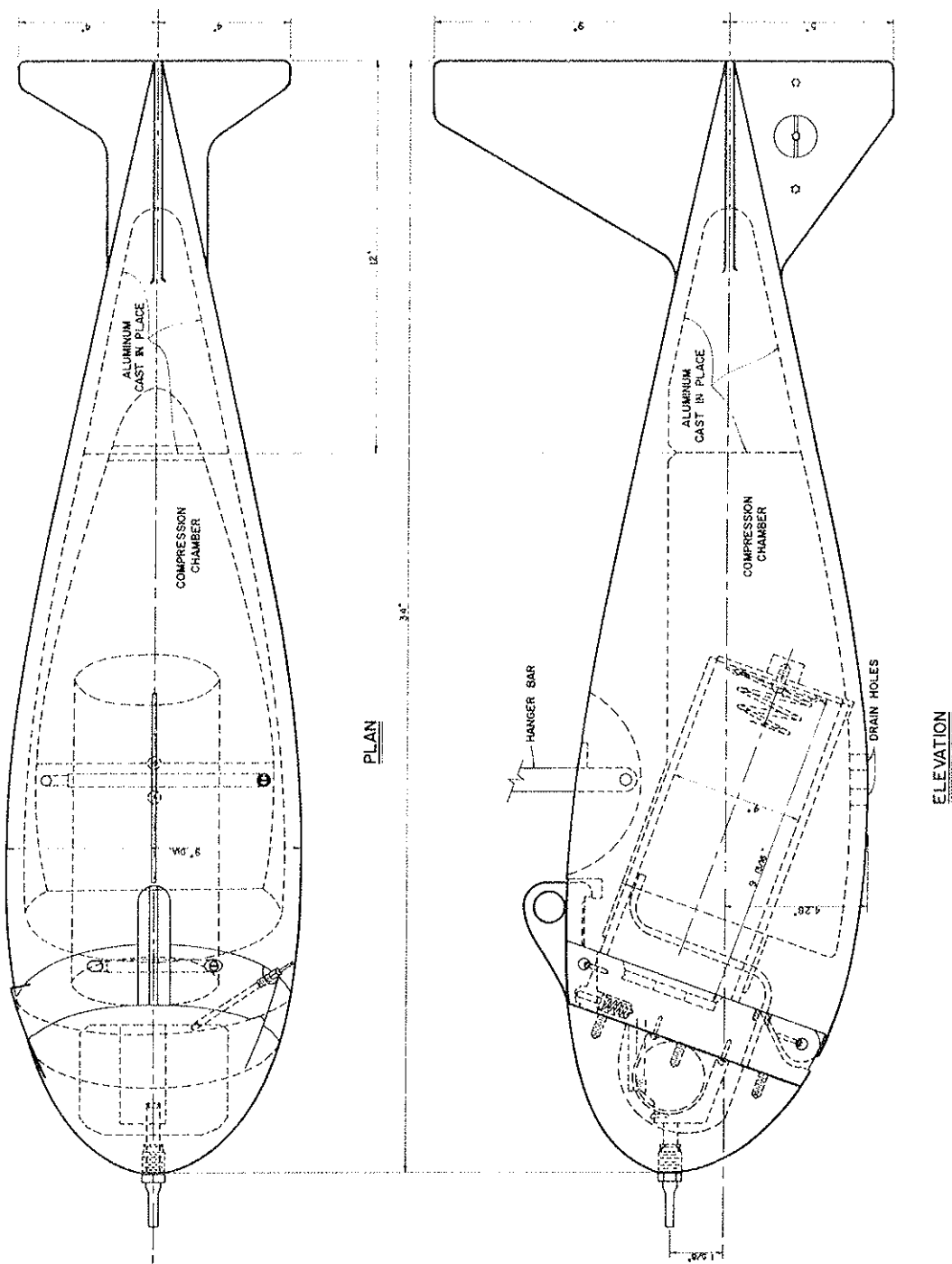


Figure 3. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER, US P-63

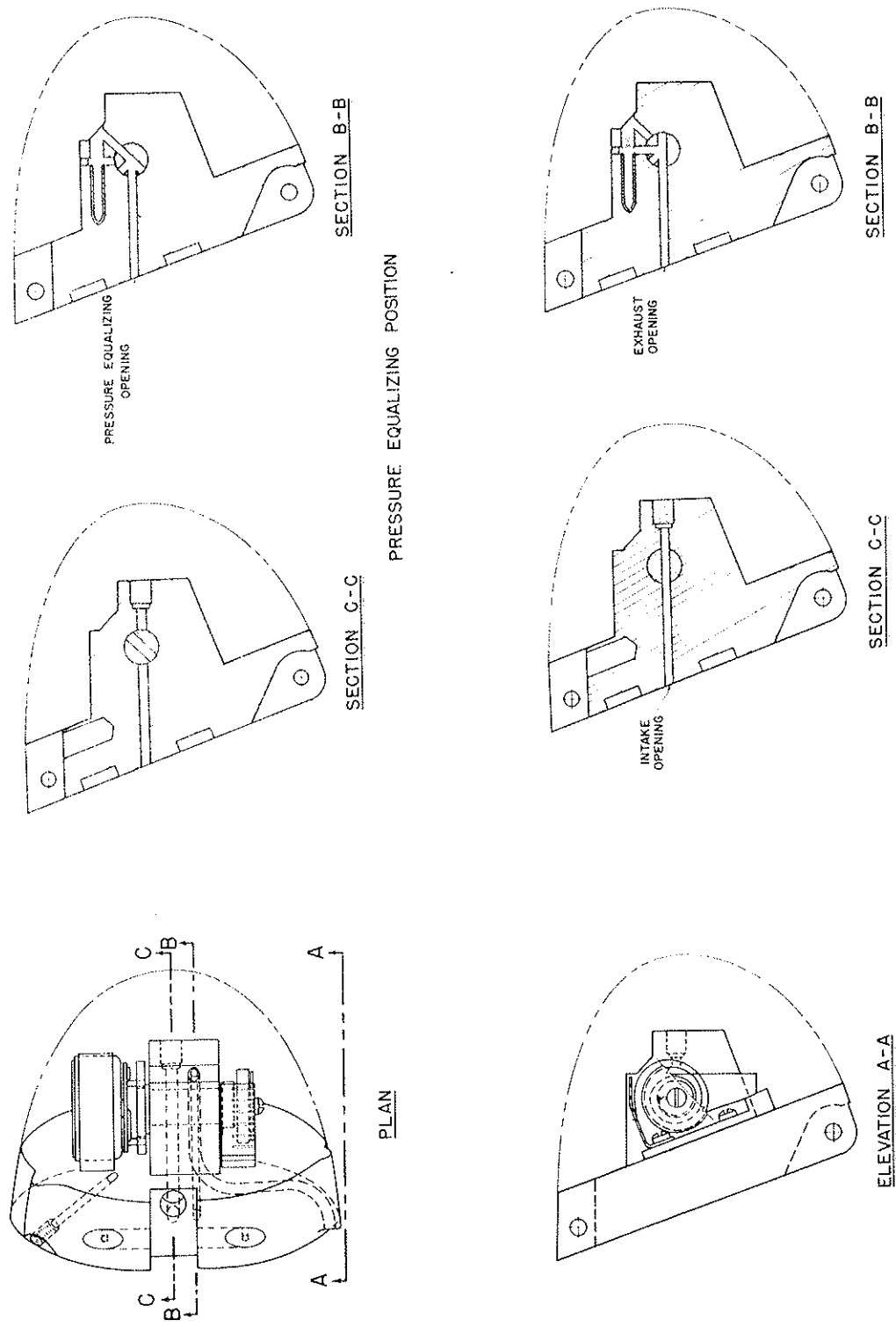


Figure 4. POINT-INTEGRATING SUSPENDED-SEDIMENT SAMPLER, US P-63, VALVE MECHANISM

of the suspension cable to the opposite terminal of the battery. The sampler takes a sample while the circuit is closed. Sampling ceases when the circuit is opened. The valve is manipulated by pressing a switch located at the operator's station.

The BP-76, an accessory battery pack (not furnished), is described elsewhere. It contains two batteries, a large capacitor, a charge meter, and switch.

—HYDRAULIC CHARACTERISTICS—

Available nozzle size = 3/16" (0.48 cm)

(blue colored nozzle only)

Maximum allowable depth varies with container sizes as follows:

<u>nozzle size</u>	<u>pint container</u>	<u>quart container</u>
3/16" (0.48 cm)	180 ft (54.9 m)	120 ft (36.6 m)

Maximum calibrated velocity = 2.0 m/s (6.6 ft/s)

Distance between nozzle and sampler bottom =

150 mm (5.91 in)

—PHYSICAL CHARACTERISTICS—

Overall length (less nozzle) = 37" (94 cm)

Approximate width = 9" dia. (22.9 cm)

Weight = 202 lbs. (91.6 kg)

Shipping weight = 253 lbs. (115 kg)

—SHIPPING INFORMATION—

Box dimensions = 40 1/2 x 15 x 18 in.

(103 x 38.1 x 45.7 cm)

Box volume = 6.3 ft³ (1.93 m³)

Point-integrating suspended-sediment sampler, US P-72

The P-72 is the aluminum version of the P-61. For a description refer to the preceeding information on the P-61.

HYDRAULIC CHARACTERISTICS

Available nozzle size = 3/16" (0.48 cm)
(blue colored nozzle only)

Maximum allowable depth varies with container sizes
as follows:

<u>nozzle size</u>	<u>pint container</u>	<u>quart container</u>
3/16" (0.48 cm)	22 m (72.2 ft)	15.5 m (50.9 ft)

Maximum calibrated velocity = 1.6 m/s (5.3 ft/s)

Distance between nozzle and sampler bottom =
109 mm (4.29 in)

PHYSICAL CHARACTERISTICS

Overall length (less nozzle) = 28" (71.1 cm)

Approximate width = 7.34" dia. (18.6 cm)

Weight = 41 lbs. (18.6 kg)

Shipping weight = 83 lbs. (37.6 kg)

SHIPPING INFORMATION

Box dimensions = 34 1/2 x 13 3/4 x 16 in.
(87.6 x 34.9 x 40.6 cm)

Box volume = 4.4 ft³ (1.34 m³)

Battery Pack, US BP-76

The BP-76 is a self-contained power supply designed to actuate the solenoid in either a P-61 or P-63 suspended-sediment sampler. See BP-76 photograph, figure 1.

The BP-76 is equipped with batteries (one Burgess TWX-2 or equivalent heavy duty 12-volt and one Burgess XX-30 or equivalent 45-volt). Replacement batteries available from the Project. Connecting leads and a battery-test resistor are included. Fresh batteries should last for more than 100 samples under usual field conditions.

PHYSICAL CHARACTERISTICS

Weight = 10 1/2 lbs. (4.76 kg)
Shipping weight = 15 lbs. (6.8 kg)
Height = 6 1/2" (16.5 cm)
Width = 3 1/4" (8.26 cm)
Length = 10" (25.4 cm)

SHIPPING INFORMATION

Box dimensions = 15 x 12 x 10 1/2 in.
(38.1 x 30.48 x 26.67 cm)
Box volume = 1.09 ft³ (0.33 m³)

Battery Pack, US BP-76HD

The BP-76HD is similar to the BP-76, except the HD model contains two 45 volt batteries. The two batteries provide a 90 volt momentary pulse, rather than a 45 volt pulse. The BP-76HD should be used if the sampler cable is longer than 100 feet. Both models are housed in the same size metal box, and come complete with batteries and accessories. Because of differences in circuitry, the BP-76 cannot be easily converted into a BP-76HD.

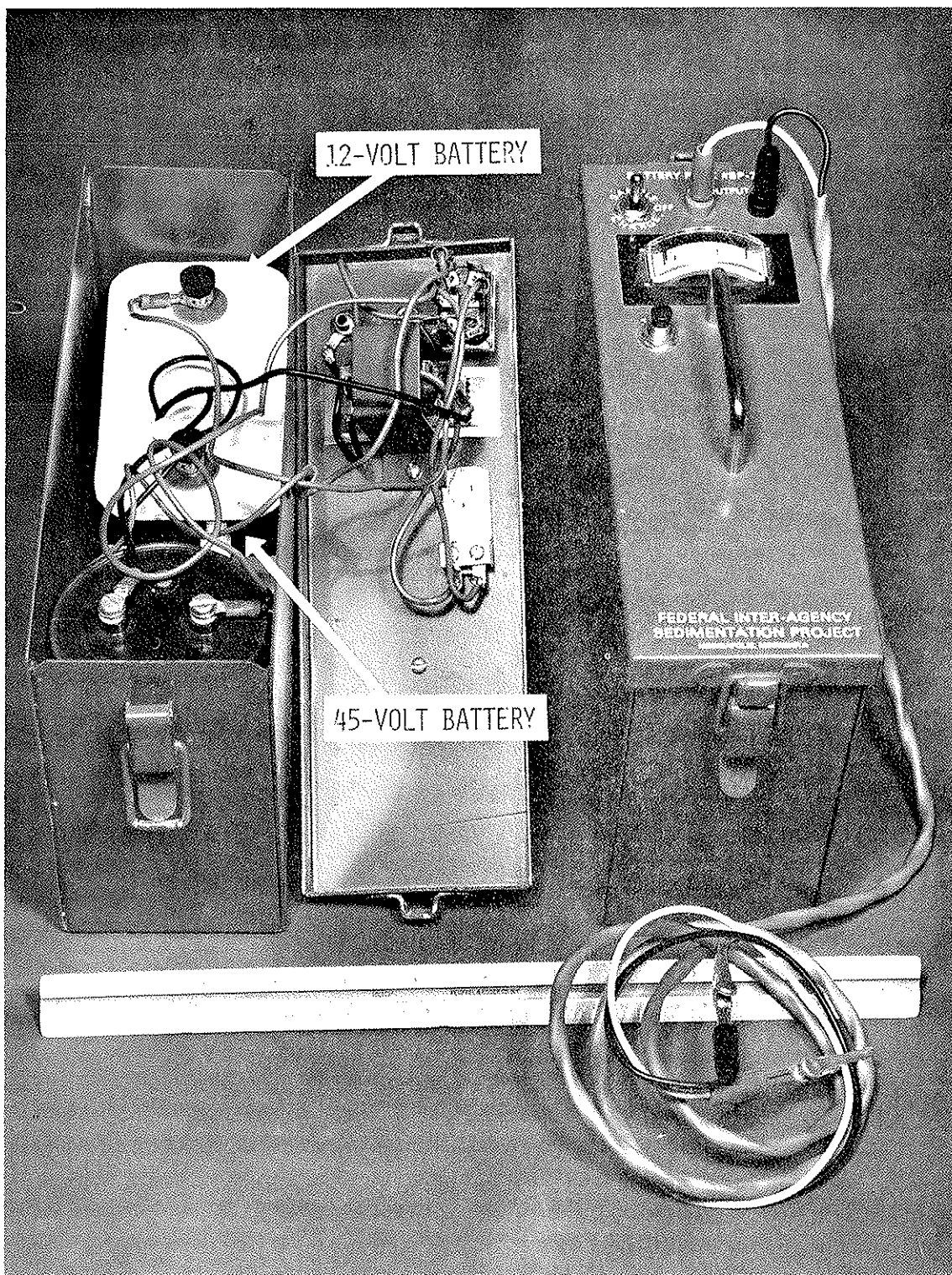


Figure 1. BATTERY PACK, US BP-76

Containers

There are three basic containers sold by the project; The glass pint milk bottle, the glass quart (typical mayonnaise size), and a tall quart polystyrene plastic (reminiscent of an old malted milk container).

The pint is used with the DH-48, DH-59, DH-75P and, with adaptors, many of the other samplers. The glass quart is used with the DH-76, D-74, P-61, P-63 and P-72 samplers. The plastic quart is identified with our pumping samplers.

The glass quart comes with an all plastic cap suitable for trace metal sampling. At extra cost a paper cap is available for the pint glass bottle. It is printed as shown in figure 1.

The project also stocks polyethylene plastic quarts and pints to be used with the DH-75P and DH-75Q. Contact the project as to prices and availability of these items.

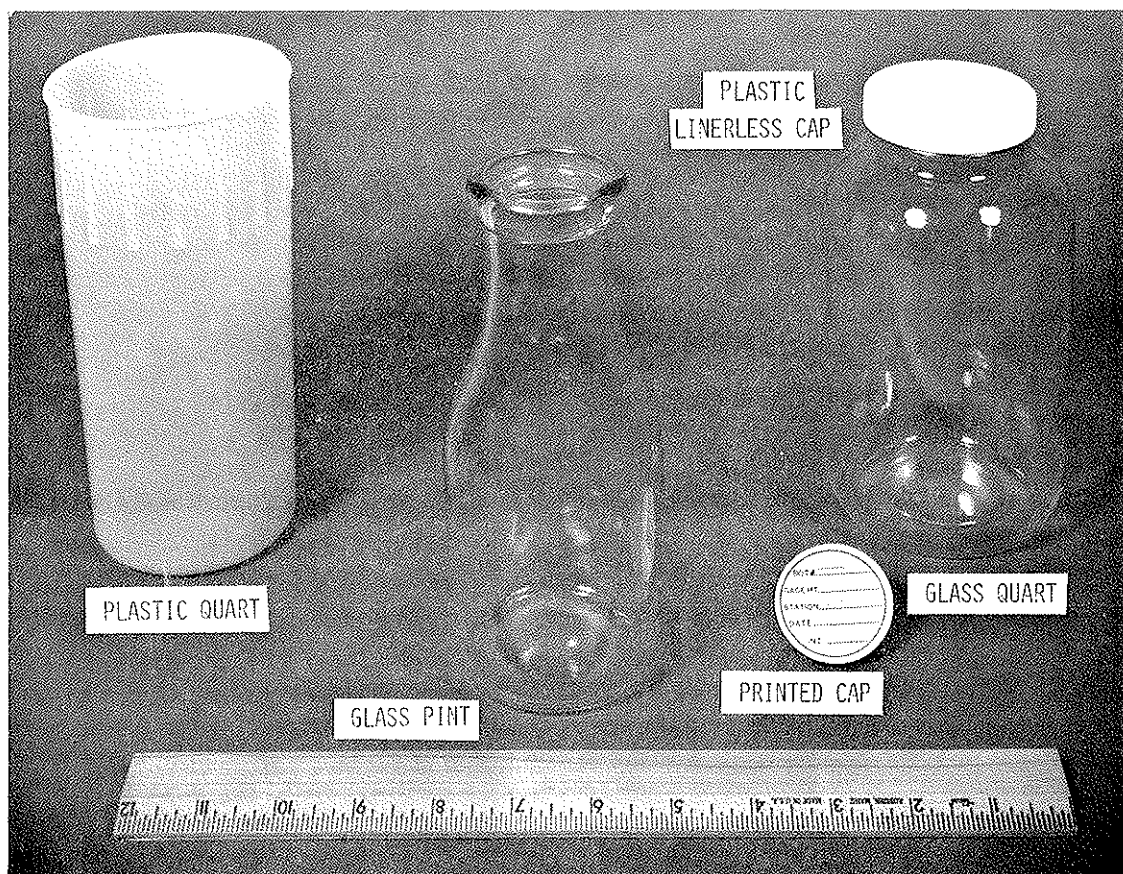


Figure 1. CONTAINERS

PHYSICAL CHARACTERISTICS

Pint bottle (24 case):

diameter = 3 1/8" (7.9 cm)
height = 7 1/4" (18.4 cm)
case shipping weight = 22 lbs. (10 kg)

Quart bottle (12 case):

diameter = 3 3/4" (9.6 cm)
height = 7" (17.8 cm)
case shipping weight = 11 lbs. (5 kg)

Plastic quart (200 case):

diameter = 3 1/2" (8.9 cm)
height = 7 1/2" (19 cm)
case shipping weight = 41 lbs. (18.6 kg)

Bottle caps (500 sleeve):

diameter = 1 3/4" (4.5 cm)
sleeve length = 25 1/4" (64.1 cm)
sleeve shipping weight = 2 1/4 lbs. (1 kg)

SHIPPING INFORMATION

Pint bottle:

truck-box dimensions = 19 1/4 x 13 x 7 3/4 in.
(48.9 x 33 x 19.7 cm)
truck-box volume = 1.12 ft³ (0.34 m³)
mail-box dimensions = 15 x 12 x 15 3/4 in.
(38.1 x 30.5 x 40 cm)
mail-box volume = 1.64 ft³ (0.5 m³)

Quart bottle:

truck-box dimensions = 16 1/2 x 12 1/2 x 7 1/4 in.
(41.9 x 31.8 x 18.4 cm)
truck-box volume = 0.87 ft³ (0.26 m³)

Plastic quart:

box dimensions = 23 1/2 x 19 1/2 x 19 1/2 in.
(49.5 x 39.4 x 33.7 cm)
box volume = 5.17 ft³ (1.58 m³)

Bottle cap:

tube dimensions = 25 1/4 x 1 3/4 in. dia.
(11.5 x 0.8 cm dia.)
tube volume = 0.2 ft³ (0.1 m³)

Wading Basket

The wading basket was primarily designed to be used with the US DH-48 as a device for holding bottles while wading in a stream.

It is capable of holding ten pint bottles at the side of the body or on the chest. The basket comes with a carrying handle and holding strap. One side of the polyethylene rope is adjustable for various operator heights. The basket is designed to have a low center of gravity to avoid tipping.

PHYSICAL CHARACTERISTICS

Height = 4 1/4" (10.8 cm)
Width = 18 1/2" (47 cm)
Depth = 7 1/2" (19.05 cm)
Weight = 4 lbs. (1.82 kg)
Shipping weight = 5 lbs. (2.27 kg)

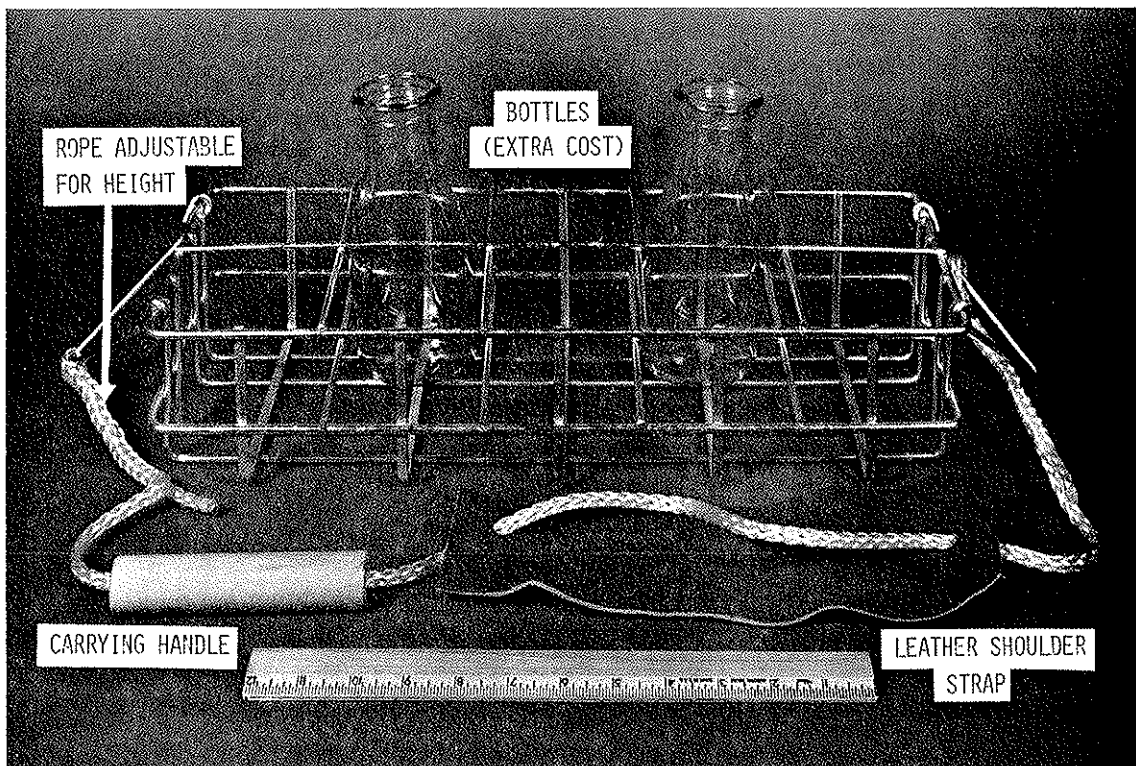
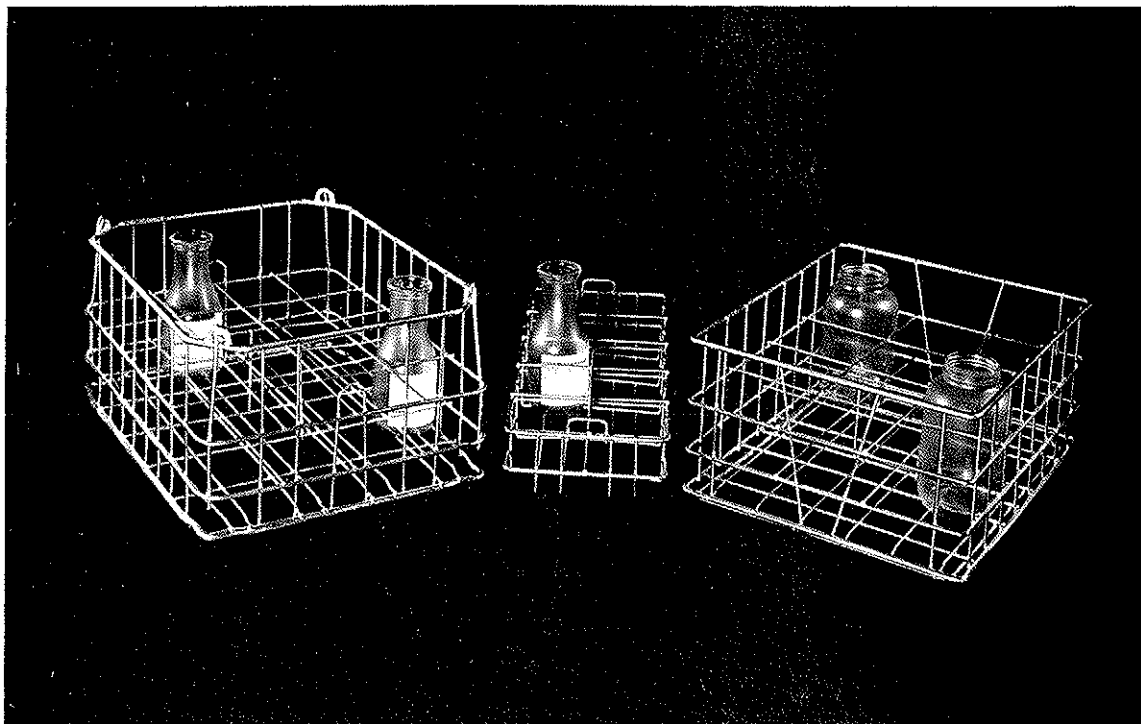


Figure 1. WADING BASKET

WIRE BASKET

Two wire baskets are available from the project. The pint basket is capable of holding 20 dairy-type pint bottles in a four by five arrangement.

The quart basket is capable of holding 12 bottles of either the glass or plastic-type that is available from the project. The quart basket has a three by four arrangement. Both baskets are designed to be stackable and have openings on two sides that act as handles. Both baskets come in several designs, but all designs are compatible with their respective size. Baskets are made out of a heavy wire that is plated for rust resistance.



— PHYSICAL CHARACTERISTICS —

Pint bottle basket:

Overall height	=	8 1/2" (21.6 kg)
Width	=	18 1/8" (47.8 cm)
Depth	=	14" (35.6 cm)
Shipping weight	=	8 pounds (3.6 kg)

Quart bottle basket:

Overall height	=	8" (20.3 cm)
Width	=	17" (43.2 cm)
Depth	=	13 1/4" (33.7 cm)
Shipping weight	=	6.5 pounds (3 kg)

Single-stage suspended-sediment sampler, US U-59

This sampler is used for automatic collection of samples from flashy, intermittent streams at remote or not easily accessible sites, which are visited by personnel at infrequent intervals.

The sampler consists of a pint milk bottle or other sampler container, a 3/16-inch inside-diameter, copper-tube air exhaust, and 3/16-inch or 1/4-inch inside-diameter, copper-tube intake, each tube bent to an appropriate shape and inserted through a stopper which fits tightly into the top of the container. There are two general types of this sampler, one with a vertical intake and the other with a horizontal intake. Under some conditions either type could be used but the two are not always interchangeable. Photographs of the single-stage suspended-sediment samplers U-59, A, B, C and D are shown in photographs in figures 1, 2, 3 and 4.

The vertical-intake sampler (type A) should be used only to sample suspended sediments finer than 62 microns. It is less subject to collection of debris and deposits of sediment in the intake nozzle than the horizontal type of intake.

The horizontal-intake sampler (type B) is used for sampling suspended sediments coarser than 62 microns. The intake is only approximately horizontal--generally it is inclined slightly downward to prevent the accumulation of sediment in the outer end of the intake. The height of the intake and exhaust tubes is dictated by surge and velocity conditions. If the exhaust tube invert does not exceed the velocity head at the time of sampling, flow may enter the intake and discharge from the exhaust and the circulation through the sampler will deposit sediment in the container in addition to that properly in the sample. If the intake tube invert does not exceed the height of water-surface surge sampling will occur intermittently and from the water-surface. Single-stage, U-59-B, figure 2, should be used where water-surface surge does not exceed 2 1/2 inches and the velocity does not exceed 4 feet per second. Single-stage, U-59-C can operate in surges up to 5 or 6 inches and velocities up to 7 feet per second. The heights of intake and air exhaust inverts should be increased for greater water-surface surges or larger stream velocities.

Several sampling units may be securely mounted, one above another, on a vertical support so that a sample is obtained as each of several known water-surface elevations are reached by a rising stage.

Normal sampling operation is as follows: As the water surface rises in the stream it also rises in the intake tube of the sampler. When water reaches the crown of the intake, flow starts over the crown, primes the siphon and begins to fill the bottle. Sampling ceases when the water level in the bottle reaches the inner end of the air exhaust. The air-lock in the air exhaust then prevents circulation through the sampler. An air-lock also forms in the intake and prevents enrichment of the sample from water surging back and forth in the intake and transporting sediment into the sample container.

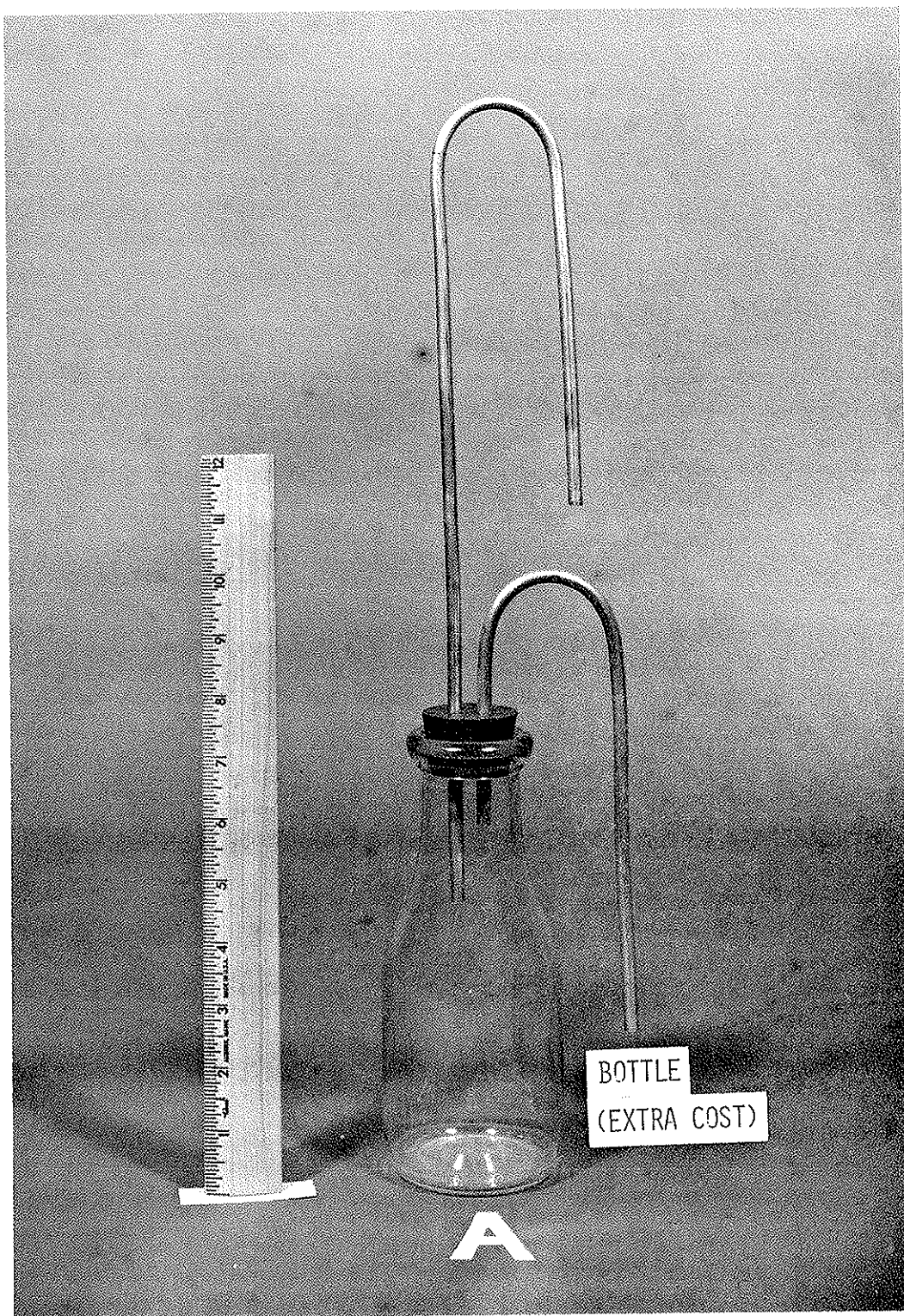
These samplers have several limitations which make them less accurate than personally attended and operated samplers. They are designed primarily for use where adequate sampling by other means would be impracticable. For stream velocities up to at least eight feet per second automatic samplers can obtain samples that are accurate to within ten percent of the sediment concentration at the sampling point. In many instances the relation of the concentration at the sampling point to that in the stream is not known as closely.

There are possibilities of serious errors if automatic single-stage suspended-sediment samplers are used for conditions to which they are not adapted. However, if the samplers are properly designed for a given set of sampling conditions, serious errors can be eliminated almost entirely.

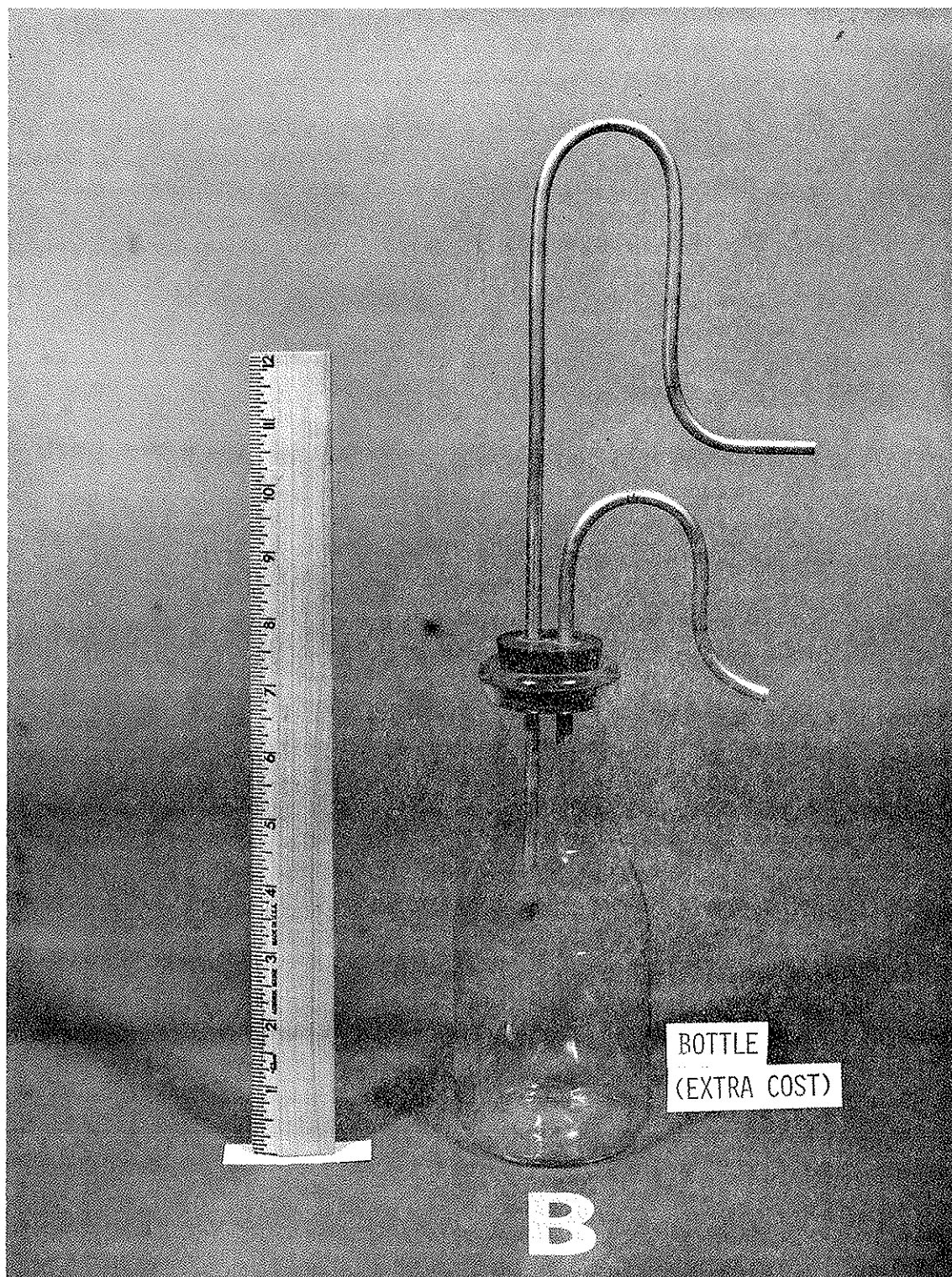
If the depth of submergence of the sample bottle increases after the sample has been taken, the air in the bottle is compressed and a small additional flow enters the bottle. Under variable submergence caused by a sequence of rising and falling stages the added water compresses air on rising stages and expanding air escapes on falling stages, thus, the quantity of air in the container becomes less and water may rise to the inner end of the intake tube. Until the added water raises the sample to the inner end of the intake, the original concentration of sediment. Once the inner end of the intake is immersed in the sample, surges in the intake can rapidly enrich the sample. At least three submergence cycles from 0 to 20 feet are required to fill the container to that level and such a sequence of submergences would be extremely rare.

Some of the advantages of the automatic single-stage sampler are:

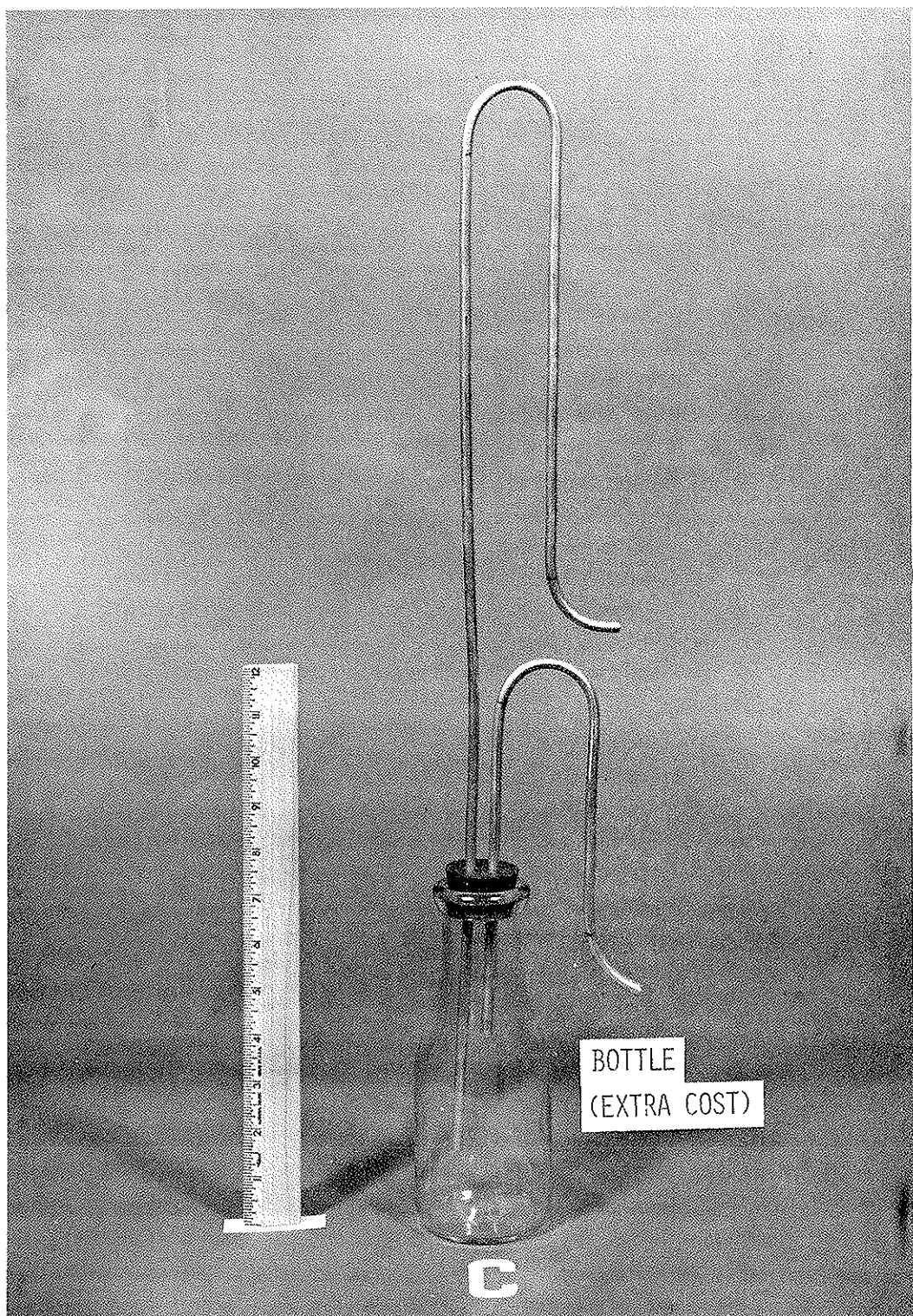
- Personnel need not be present at the time of sampling.
- Samples may be obtained at predetermined stages of the stream.
- Sampling apparatus is simple and inexpensive.



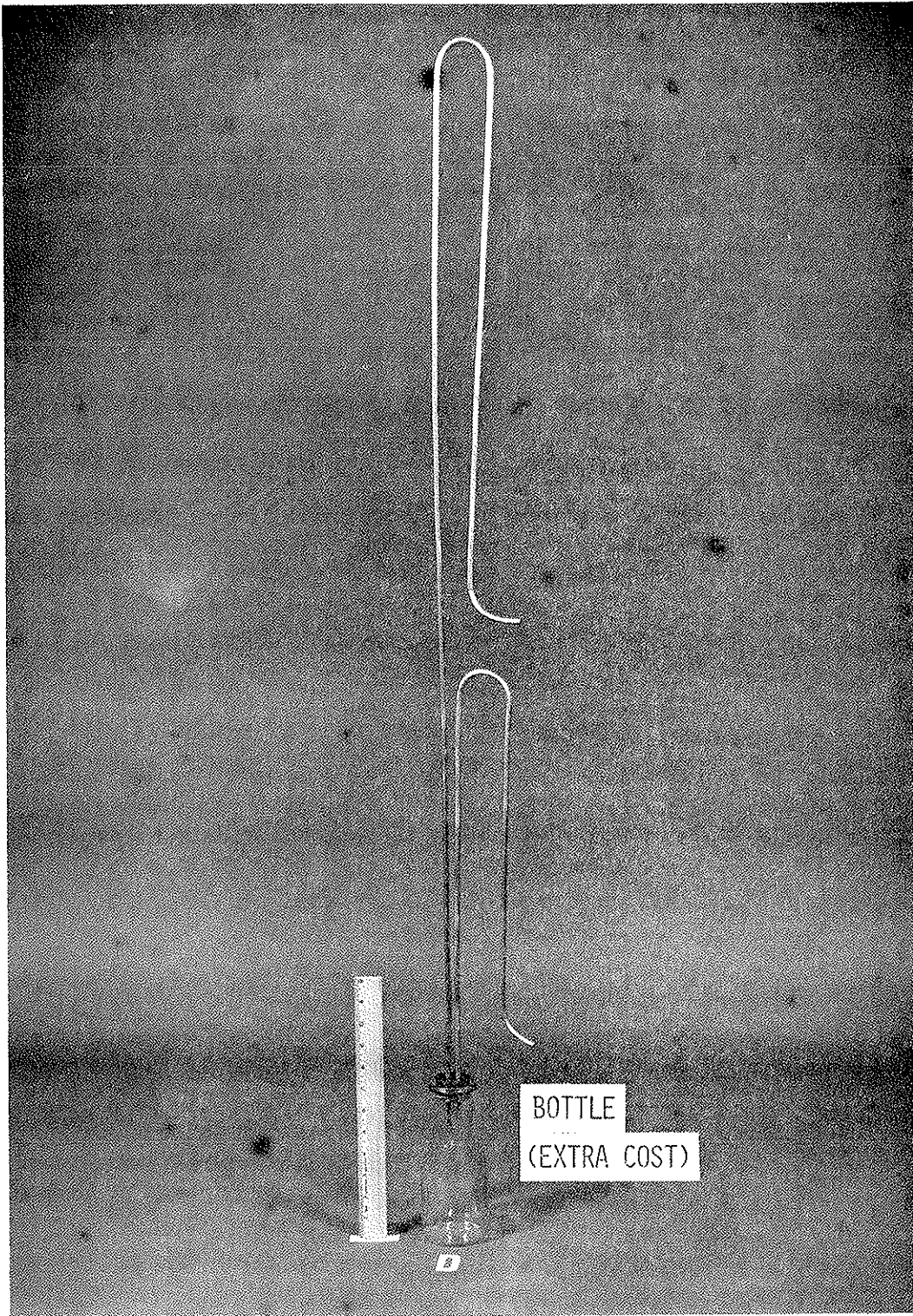
Single-stage suspended-sediment sampler, US U-59, type A



Single-stage suspended-sediment sampler, US U-59, type B



Single-stage suspended-sediment sampler, US U-59, type C



Single-stage suspended-sediment sampler, US U-59, type D

Some of the limitations of the single-stage sampler are:

- Samples are taken at or near the surface of the stream.
- Samples will usually be obtained near the edge of the stream.
- Intake velocities rarely equal stream velocities.
- No samples are taken on the falling stage of the stream.
- The original sample may be altered by subsequent submergence.
- No one sampler design is best for all stream conditions.

An in-depth discussion and description of the single-stage samplers can be found in Report No. 13 which is available from the Project upon request.

PHYSICAL CHARACTERISTICS					
TYPE:		A	B	C	D
Weight (approximate)	lb kg	1 (0.45)	1 (0.45)	1 (0.45)	1 1/2 (0.68)
Shipping weight (approximate)	lb kg	2 (0.91)	2 (0.91)	2 (0.91)	2 1/2 (1.1)
Height	in cm	11 1/2 (29.2)	16 1/2 (41.9)	23 1/2 (59.7)	45 5/8 (1160)
Width	in cm	5 (12.7)	3 5/8 (9.21)	4 1/2 (11.4)	5 (12.7)
Depth	in cm	1 5/8 (4.13)	1 5/8 (4.13)	1 5/8 (4.13)	1 5/8 (4.13)

Single-stage Sampler, US U-73

This sampler consists of a Z-shaped flow-through container with built-in stoppers at each end. The spring-loaded stoppers are tripped when a float severs a twin-plastic tension line. The float can be set to sever the line on the rising or falling stage.

The container is made from 2-inch copper pipe necked down to 3/4-inch tubing at the intake and exhaust. The container breaks apart for removal of the sample, flushing, and resetting the stopper spring. There is sheet-metal housing for trash protection. A photograph and diagram of the U-73 are shown in figures 1 and 2.

PHYSICAL CHARACTERISTICS

Height = 27" (68.6 cm)
Width = 8" (20.3 cm)
Depth = 6" (15.2 cm)
Weight = 30 lbs. (13.6 kg)
Shipping weight = 50 lbs. (22.7 kg)

SHIPPING INFORMATION

Box dimensions = 20 x 16 x 36 in.
(50.8 x 40.6 x 91.4 cm)
Box volume = 6.67 ft³ (2.03 m³)

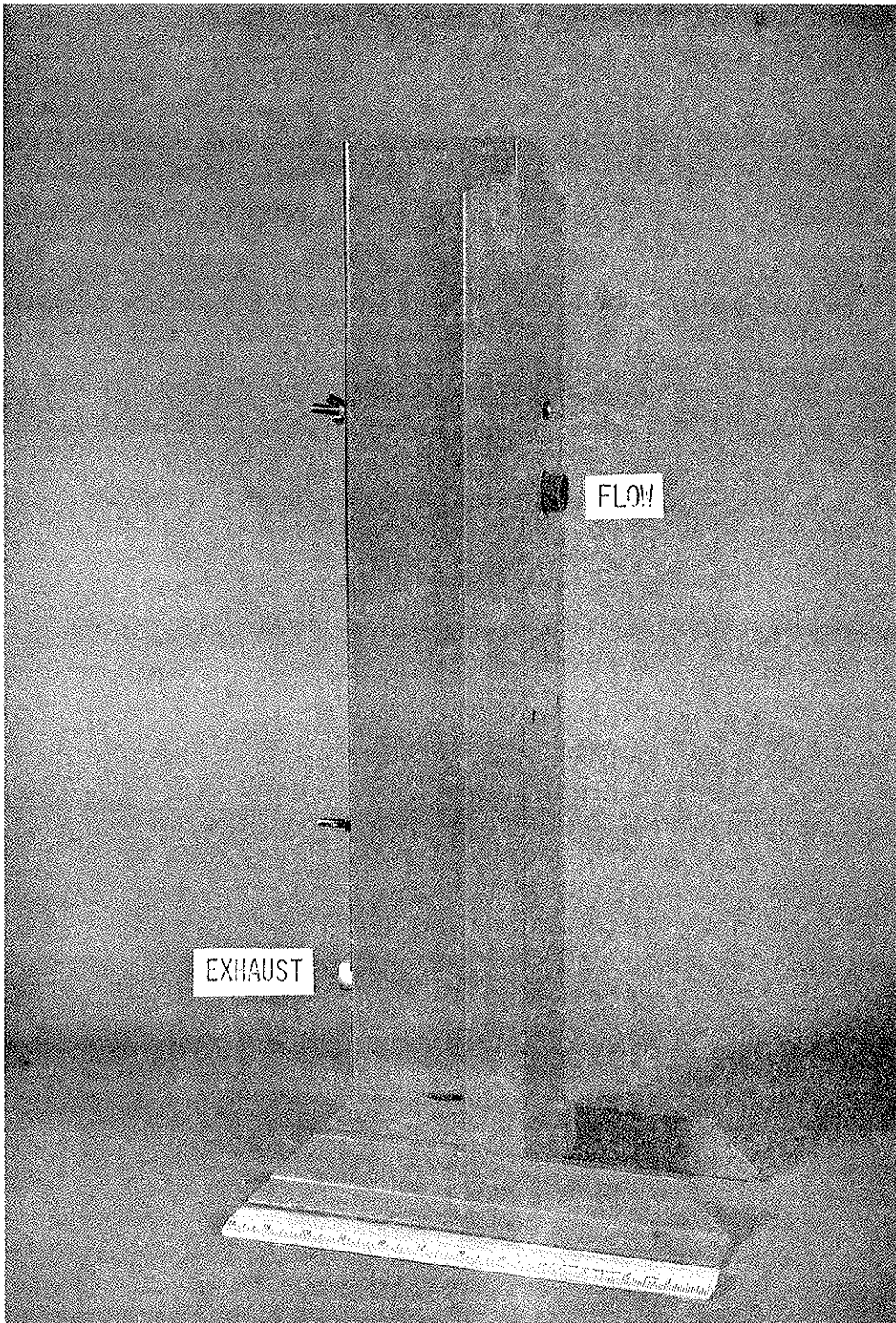


FIGURE 1. SINGLE-STAGE SAMPLER, US U-73

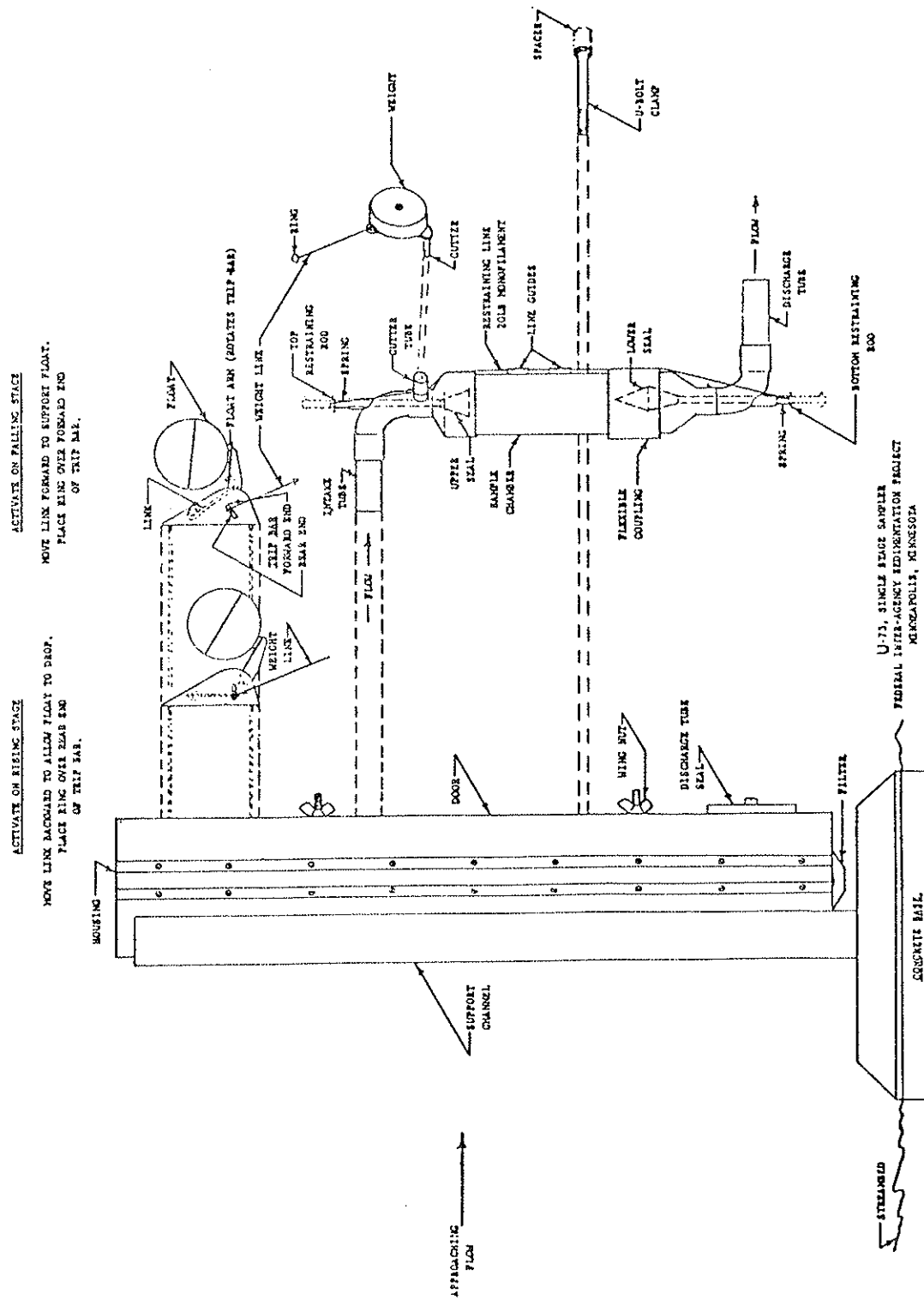


FIGURE 2. Exploded view of sampler, US U-73

Pumping-type bottling sampler, US PS-69

This pumping sampler was designed to collect stream samples automatically at remote, unattended sites. The sample volume is adjustable and separate pumps are used for backflushing and sampling. The samples are distributed to the individual containers by means of a motor-driven arm. The containers, pints or quarts, are placed in a drawer which facilitates changing containers.

This sampler holds 72 containers that may be either pint glass bottles or quart plastic containers. The sampler is powered by a 36-volt battery (three series-connected, 12-volt auto batteries, not furnished) which should be recharged after each full set of samples.

The pumping cycle may be initiated by a time clock or a change-of-stage switch (both furnished). A cutoff float switch is provided to prevent starting the machine if the water surface falls below the sampler's intake.

This sampler is shipped partly disassembled, but can be reassembled in about one hour. All of the control circuitry is contained in a plug-in unit which can be removed for servicing. The sampler may be moved in the assembled form, but wheels are not provided. A photograph of the sampler with drawer extended is shown in figure 1, and a schematic drawing of the plumbing system is shown in figure 3. The drawer is partially filled with quart plastic containers. The pumps are on the plate at the floor level, the backflush barrel is on the left, and the waste and sample funnels are at the top. The electrical control box is out of sight below the top deck. The time clock is attached to the other side of the plate holding the sample funnels.

This sampler obtains its samples from a single point in the stream. As with any single-point sampling device, the concentration sampled by the device must be related to the mean concentration in the cross-section to be of the most value. The greater the turbulence and the finer the suspended material at the site, the more nearly representative will be the pumped samples. The standard samples for comparison are usually those obtained with manual depth-integrating samplers.

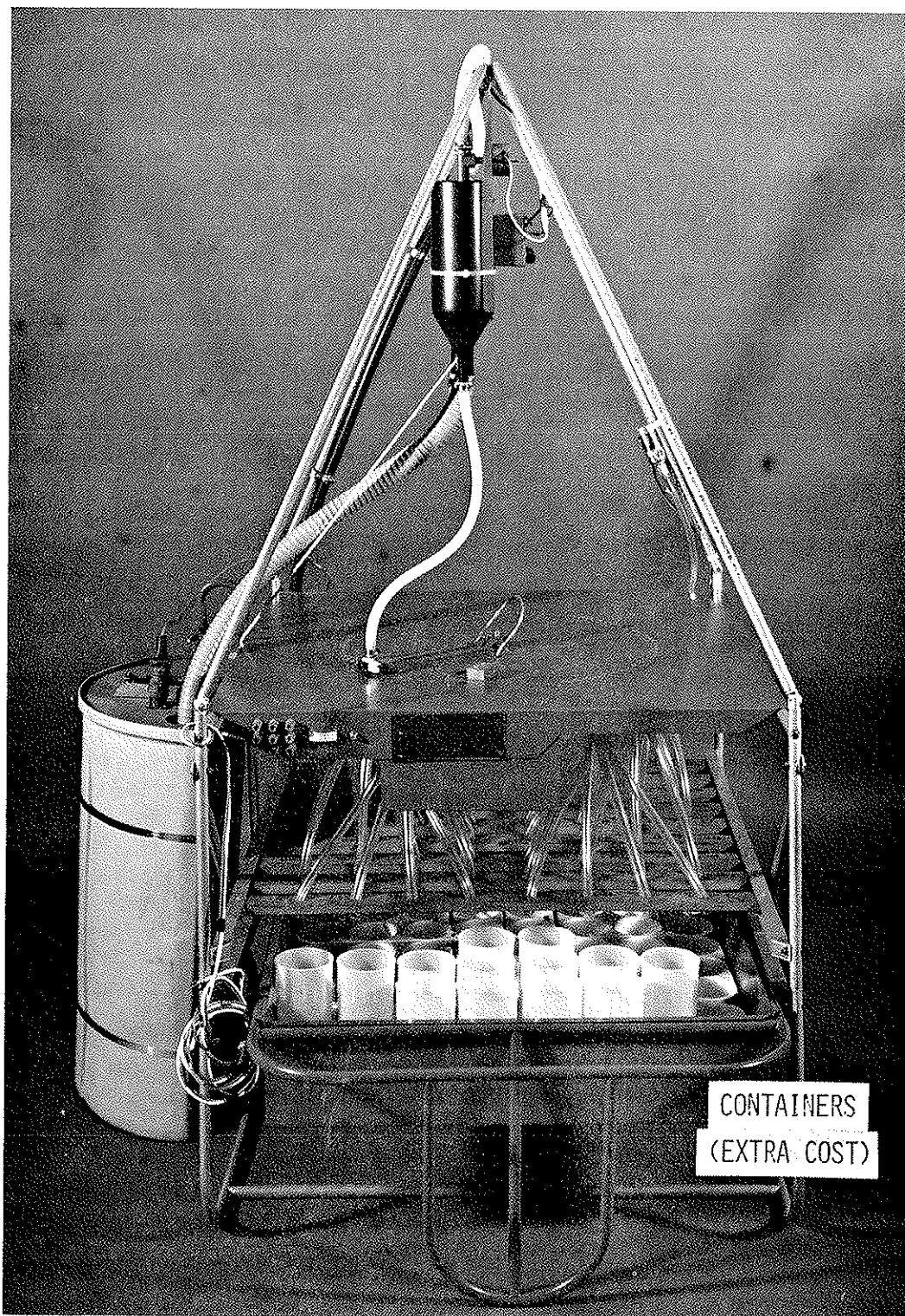


Figure 1. PUMPING-TYPE BOTTLING SAMPLER, US PS-69

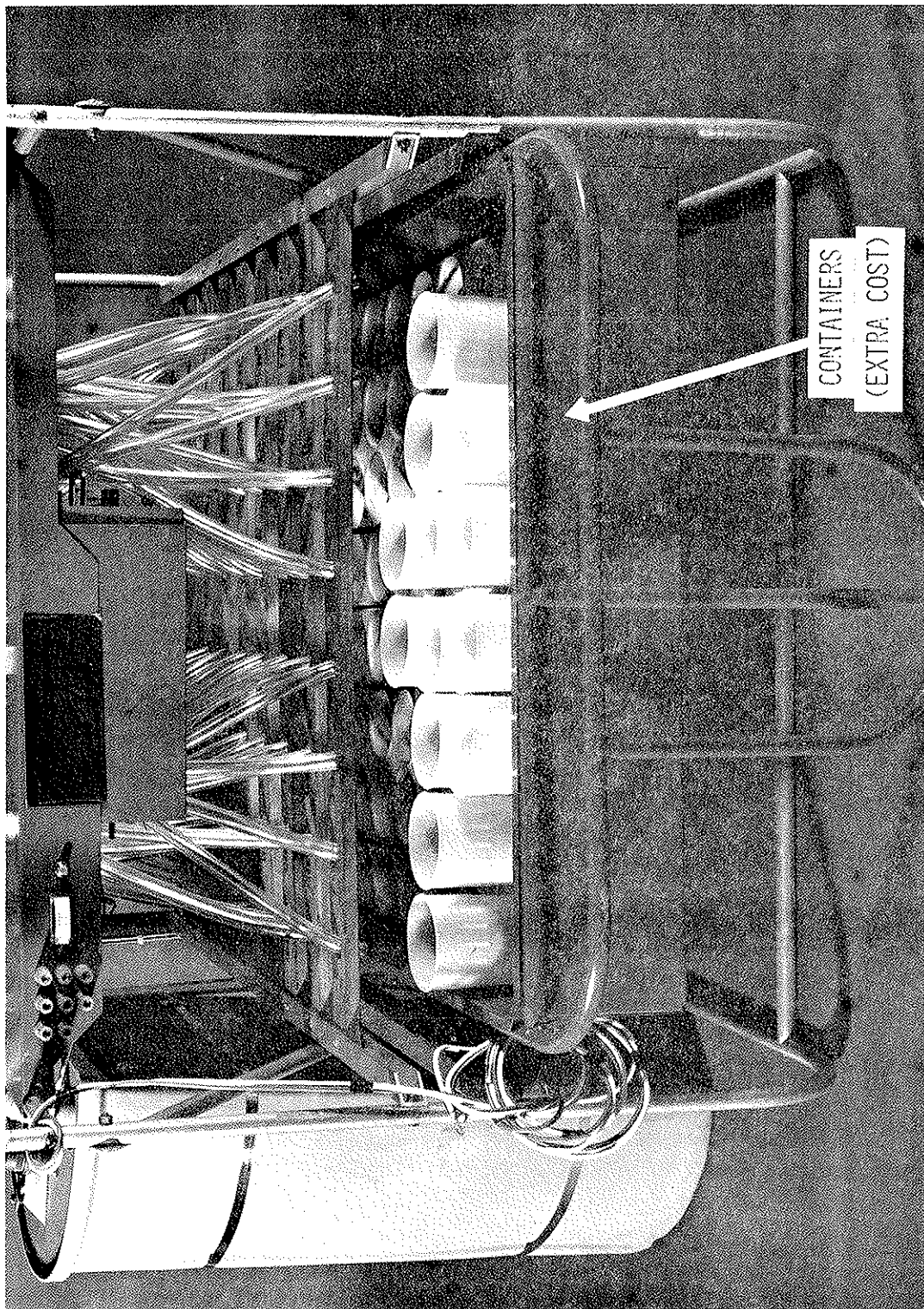


Figure 2. PUMPING-TYPE BOTTLING SAMPLER, US PS-69

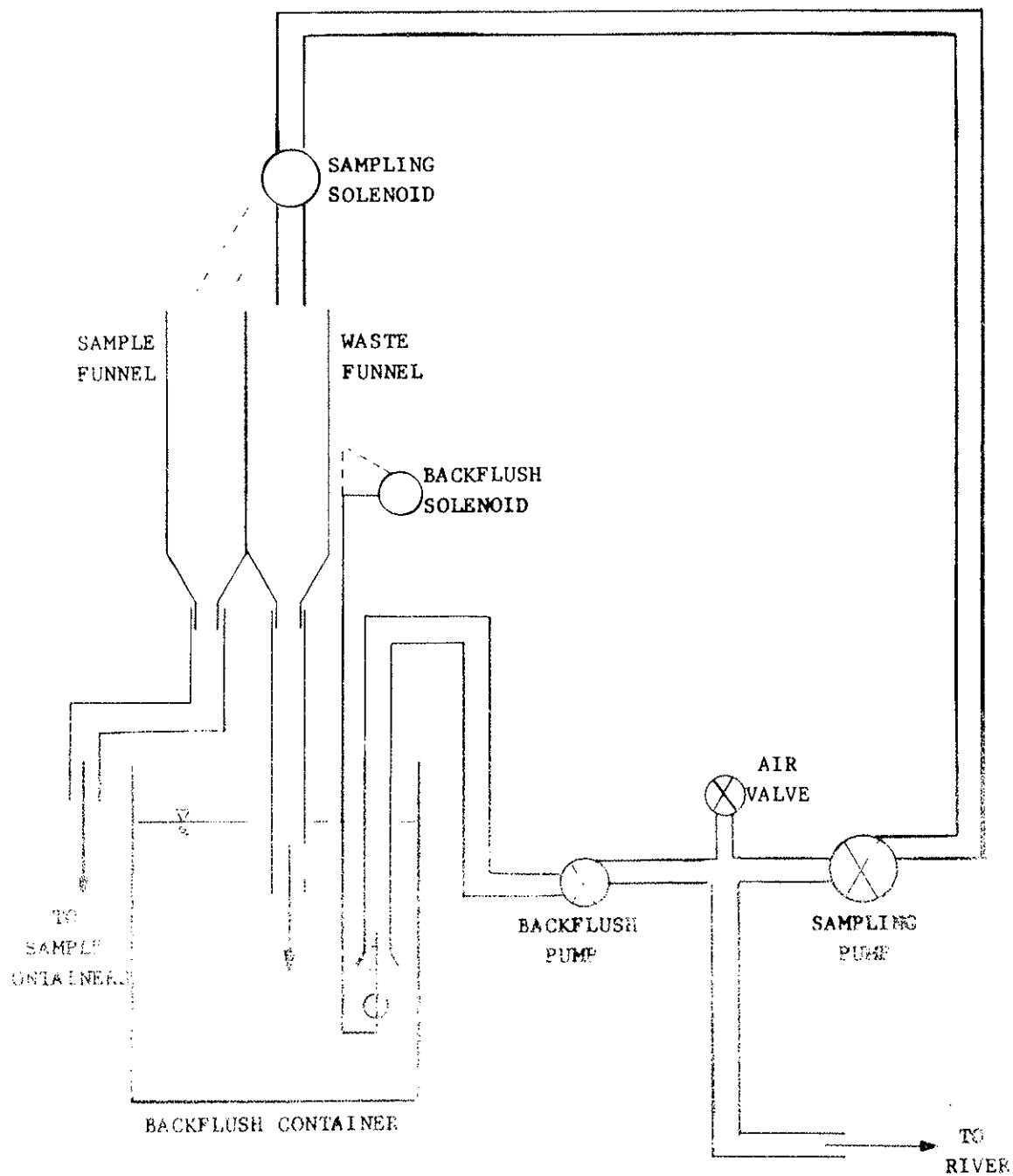


Figure 3. SCHEMATIC DIAGRAM OF PS-69 PLUMBING

—PHYSICAL CHARACTERISTICS—

Overall height = 72" (183 cm)
Width = 42" (107 cm)
Depth = 36" (91.4 cm)
Weight = 250 lbs. (113.2 kg)
Shipping weight = 285 lbs. (129 kg)

—Shipping Information—

Box dimensions = 45 x 45 1/2 x 41 in.
(114 x 116 x 104 cm)
Box volume = 48.6 ft³ (1.4 m³)

Control box for PS-69, US CB-69

The PS-69 control box is the device that sequences the cycle steps performed by the PS-69 during a sample extraction. The device consists of four time delay relays, three power relays, two intermediate relays and a printed circuit board. Cycle steps are pre-set but can be changed upon request. Each unit is carefully checked at the lab before being sent out.

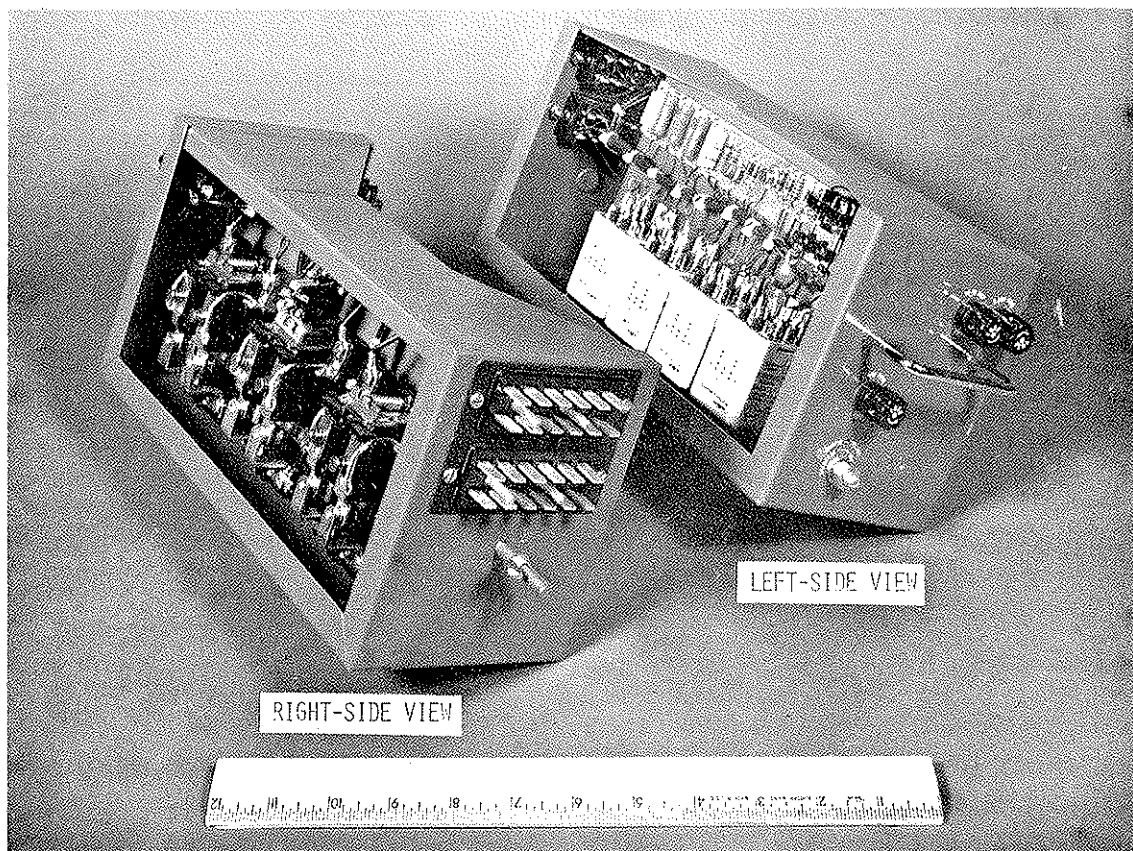


Figure 1. Control box for PS-69, US CB-69

PHYSICAL CHARACTERISTICS

Length = 14 1/4" (36.2 cm)
Width = 5" (12.7 cm)
Height = 6" (15.2 cm)
Weight = 8 lbs. (3.6 kg)
Shipping weight = 12 lbs. (5.4 kg)

SHIPPING INFORMATION

Box dimensions = 15 x 12 x 10 1/2 in.
(38.1 x 30.4 x 26.7 cm)
Box volume = 1.09 ft³ (0.33 m³)

Dual-sample trigger for the PS-69, US DST-76

This device is an optional accessory for the PS-69, which causes the sampler to cycle twice each time the PS-69 is activated. The device doubles the number of samples, which can be averaged to reduce scatter and increase confidence.

This device plugs directly into the PS-69 plug panel. A photograph is shown in figure 1.

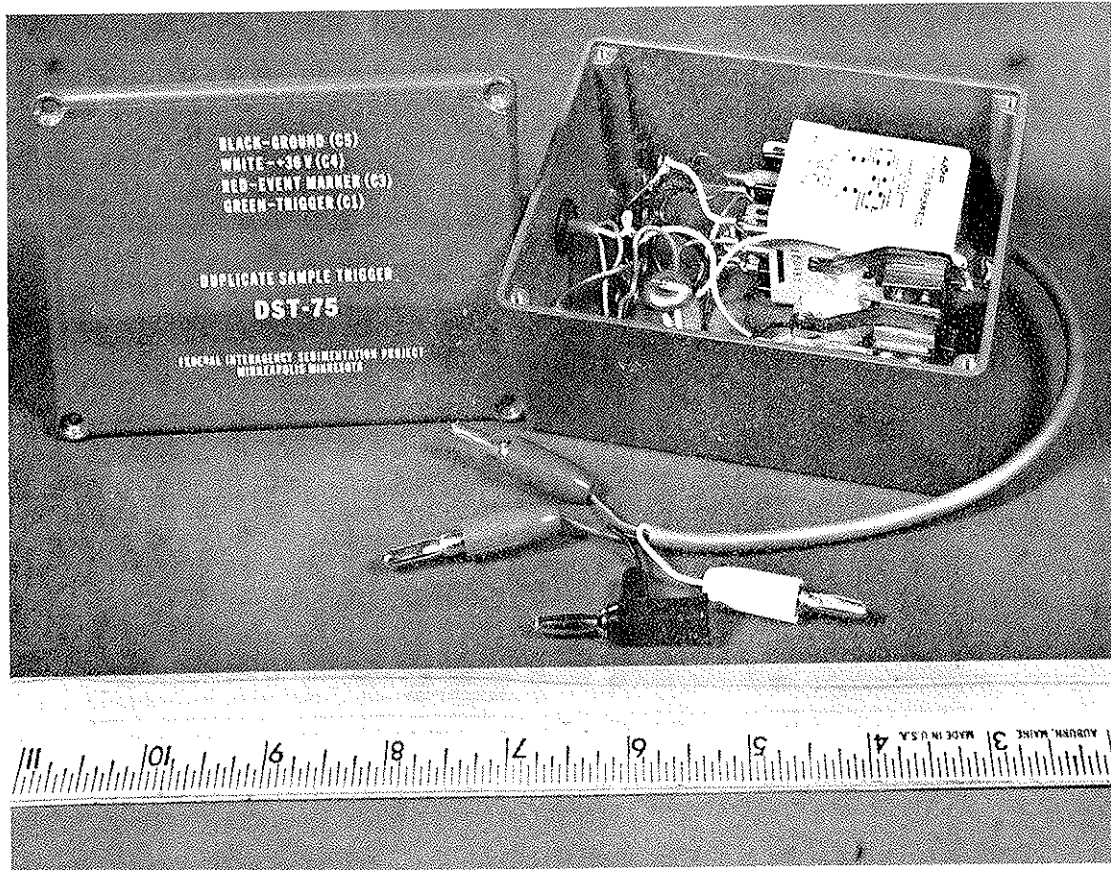


Figure 1. DUAL-SAMPLE TRIGGER FOR THE PS-69, US DST-76

—PHYSICAL CHARACTERISTICS—

Length = 4 3/4" (12.1 cm)
Width = 3 3/4" (9.5 cm)
Height = 2 1/4" (5.7 cm)
Weight = 1 1/2 lbs. (0.68 kg)
Shipping weight = 2 1/2 lbs. (1.13 kg)

—SHIPPING INFORMATION—

Box dimensions = 17 x 13 1/2 x 12 in.
(43.2 x 34.3 x 30.5 cm)
Box volume = 1.6 ft³ (0.49 m³)

FP event marker and delta-stage switch, US FP-73 EM

These units fit existing holes in the Fisher-Porter punch-tape, water-stage recorder (ADR). The event marker taps a continuous-loop of typewriter ribbon to mark the paper tape when a sample has been collected by a pumping sampler. A 36-volt tapper solenoid is standard, but a 12-volt model is also available.

The delta-stage (change-in-stage) switch activates the pumping sampler once or twice per revolution of the float wheel on the recorder. The magnet(s) trip the encapsulated reed switch. A photograph of the FP-73 is shown in figure 1.

—SHIPPING INFORMATION—

Shipping weight = 2 lbs. (0.9 kg)

Box dimensions = 6 1/4 x 5 1/2 x 7 1/2 in.
(15.9 x 14 x 19 cm)

Box volume = 0.15 ft³ (0.05 m³)

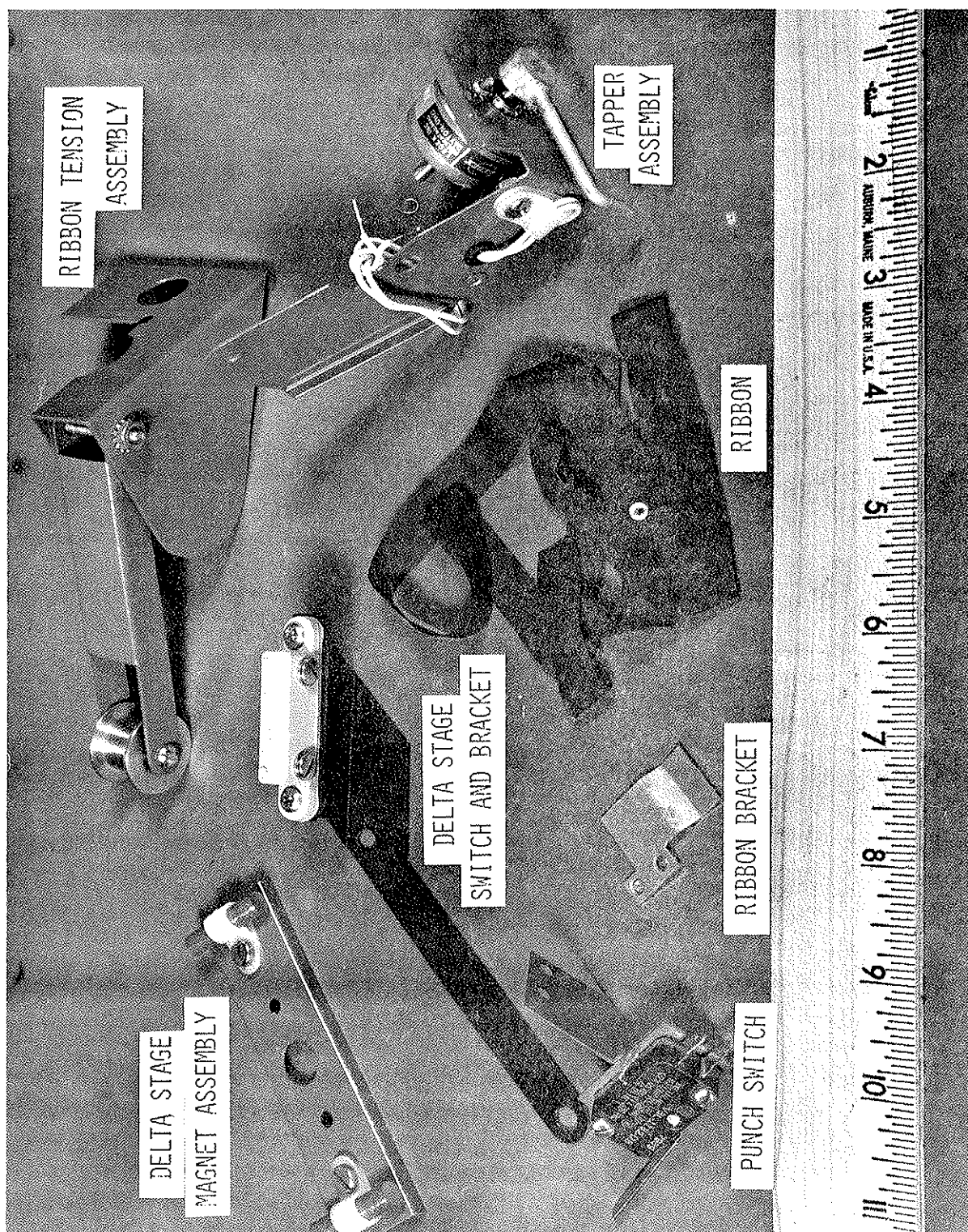


Figure 1. FP EVENT MARKER AND DELTA-STAGE SWITCH,
US FP-73 EM

LS event marker and delta-stage switch, US LS-35 EM

These units fit existing holes in the Leupold-Stevens A-35 analog water-stage recorder. The event marker taps a continuous-logs typewriter ribbon to mark the chart when a sample has been collected by a pumping sampler. A 36-volt tapper solenoid is standard, but a 12-volt model is also available.

The delta-stage (change-in-stage) switch activates the pumping sampler once per magnet per revolution of the recorder's float wheel. Only one magnet is provided but many can be attached to the float wheel. Attachment may be with the clip provided (through holes drilled in the float wheel) or by adhesive (not furnished). The magnet(s) trip the encapsulated reed switch.

—SHIPPING INFORMATION—

Shipping weight = 1 3/4 lbs. (0.8 kg)
Box dimensions = 6 1/4 x 5 1/2 x 7 1/2 in.
 (15.9 x 14 x 19 cm)
Box volume = 0.15 ft³ (0.05 m³)

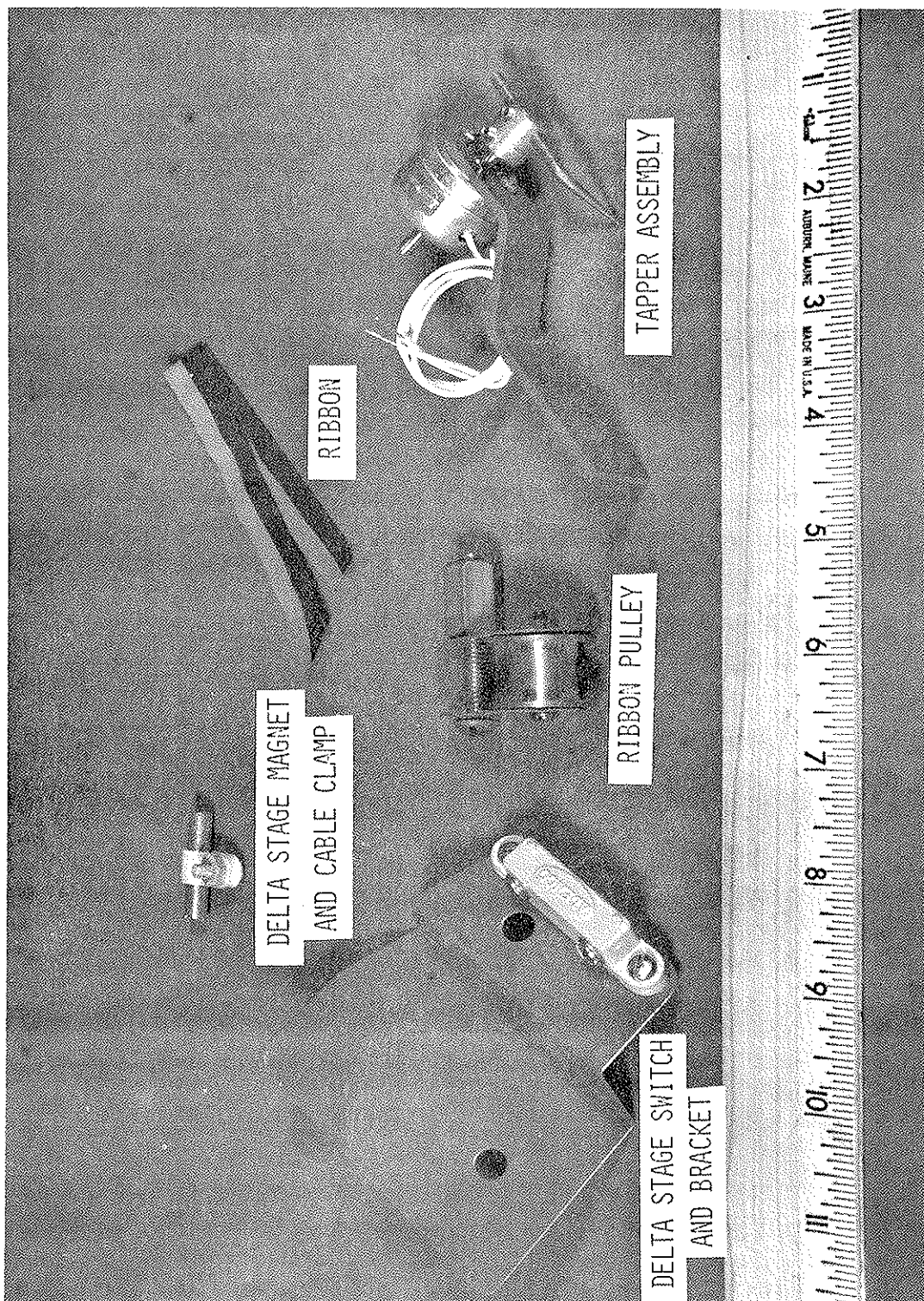


Figure 1. LS event marker and delta-stage switch,
US LS-35 EM

LS digital event marker and delta-stage switch, US LSD-76 EM

These units fit existing holes in the Leupold-Stevens digital, punch-tape, water-stage recorder (ADR). The event marker taps a continuous-logs of typewriter ribbon to mark the paper tape when a sample has been collected by a pumping sampler. A 36-volt tapper solenoid is standard, but a 12-volt model is also available.

The delta-stage (change-in-stage) switch activates the pumping sampler once or twice per revolution of the recorder's float wheel. The magnet(s) trip the encapsulated reed switch.

SHIPPING INFORMATION

Shipping weight = 1 1/2 lbs. (0.7 kg)
Box dimensions = 6 1/2 x 5 1/2 x 7 1/2 in.
(15.9 x 14 x 19 cm)
Box volume = 0.15 ft³ (0.05 m³)

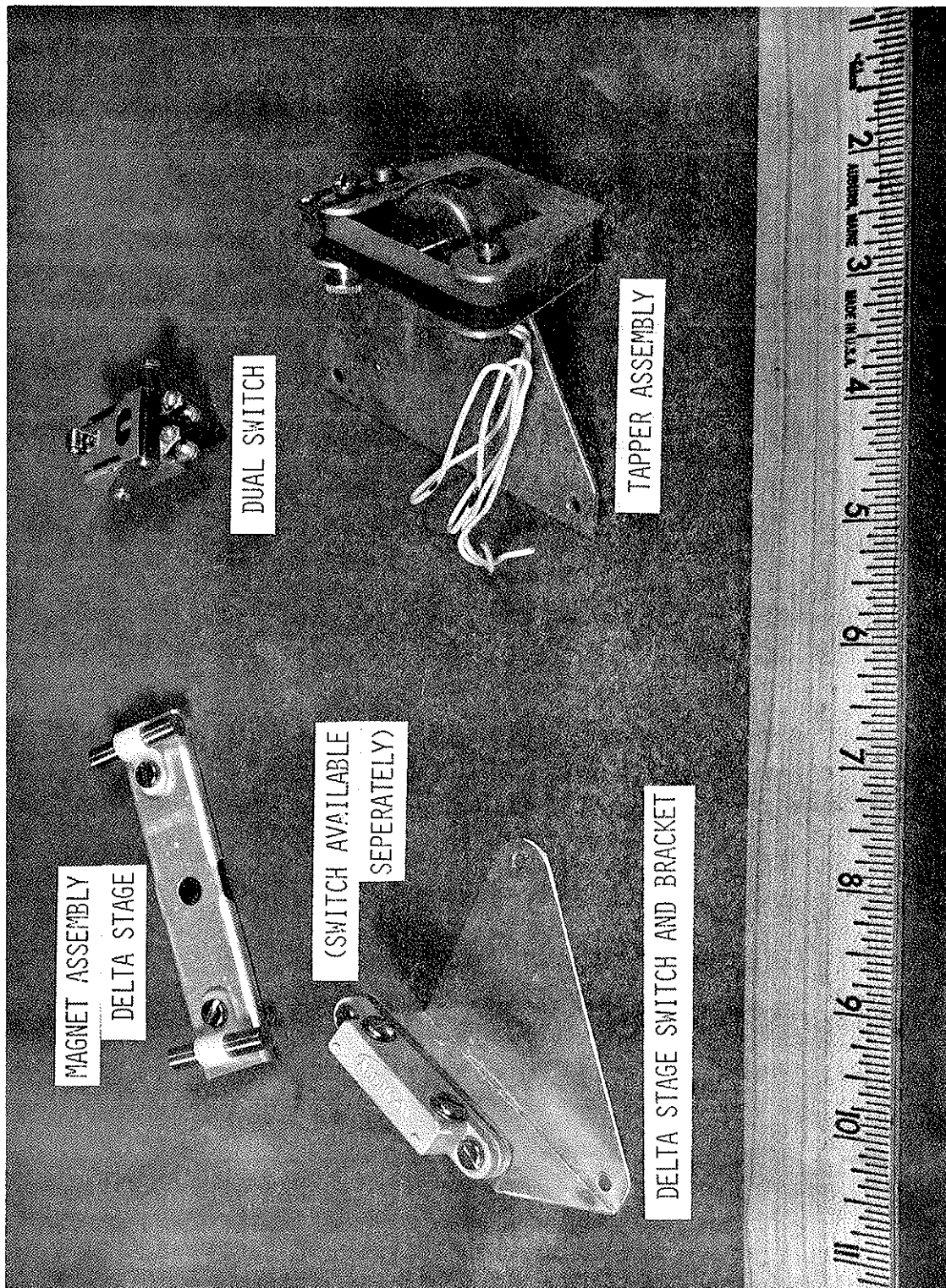


Figure 1. LS digital event marker and delta-stage switch
US LSD-76 EM

Control box extension cable for PS-69, US EC-76

This cable allows the PS-69 control box to be removed from its location below the top deck. With the control box out in the open, the operation of relays may be observed and "live" test measurements made.

The standard length is five feet, but longer cables can be made up at extra cost.

PHYSICAL CHARACTERISTICS

Cord length = 5 ft. (15.2 m)
Weight = 5 lbs. (2.27 kg)
Shipping weight = 7 lbs. (3.18 kg)

SHIPPING INFORMATION

Box dimensions = 17 x 13 1/2 x 12 in.
(43.18 x 34.29 x 30.48 cm)
Box volume = 1.6 ft³ (0.49 m³)

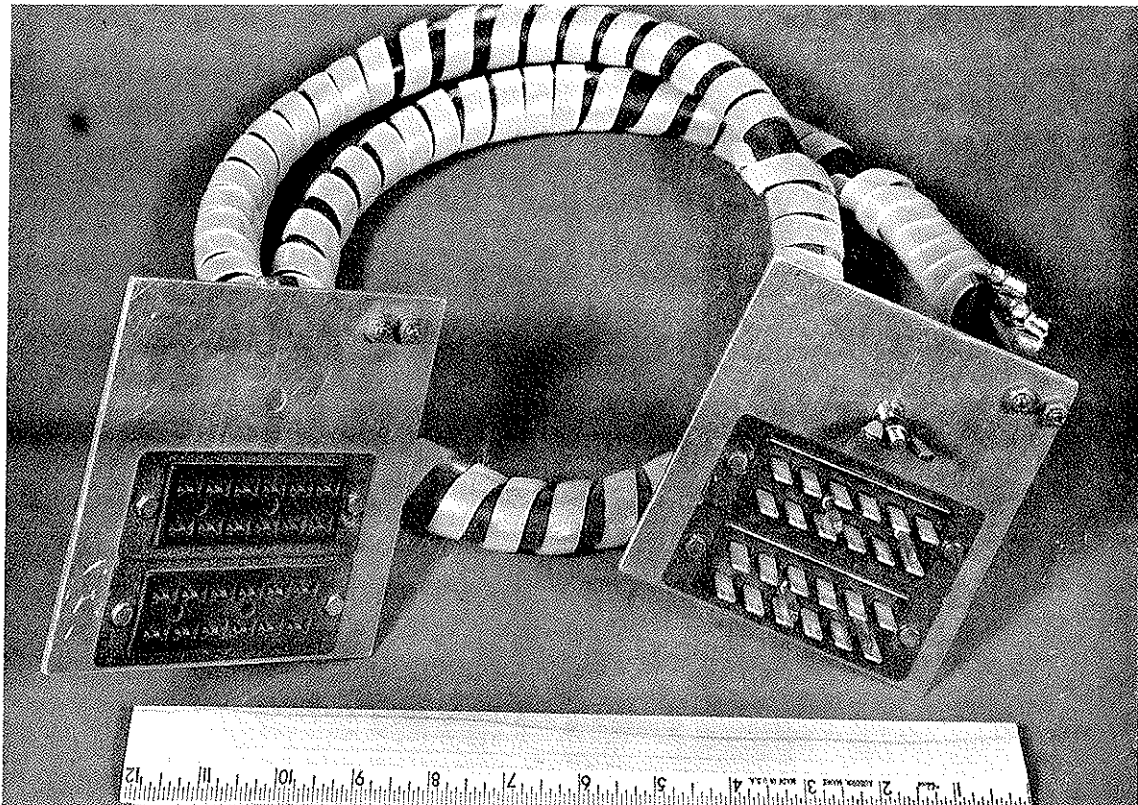


Figure 1. CONTROL BOX EXTENSION FOR PS-69, US EC-76

Memory Latch, US ML-73

The memory latch unit synchronizes the sampling cycle to the sequence of an interval-type water-stage recorder, such as the commonly used punch-tape recorder. This type of recorder advances only periodically, say every 15 minutes, while the pumping sampler can be cycled in two minutes. The memory latch suspends the sampling cycle until the punched-tape recorder next activates. Thus, multiple superimposed event marks are prevented and any uncertainty in the sample time.

This unit can be supplied with each sampler when operation with punch-tape recorders is specified. Specify 12 or 32 volts.

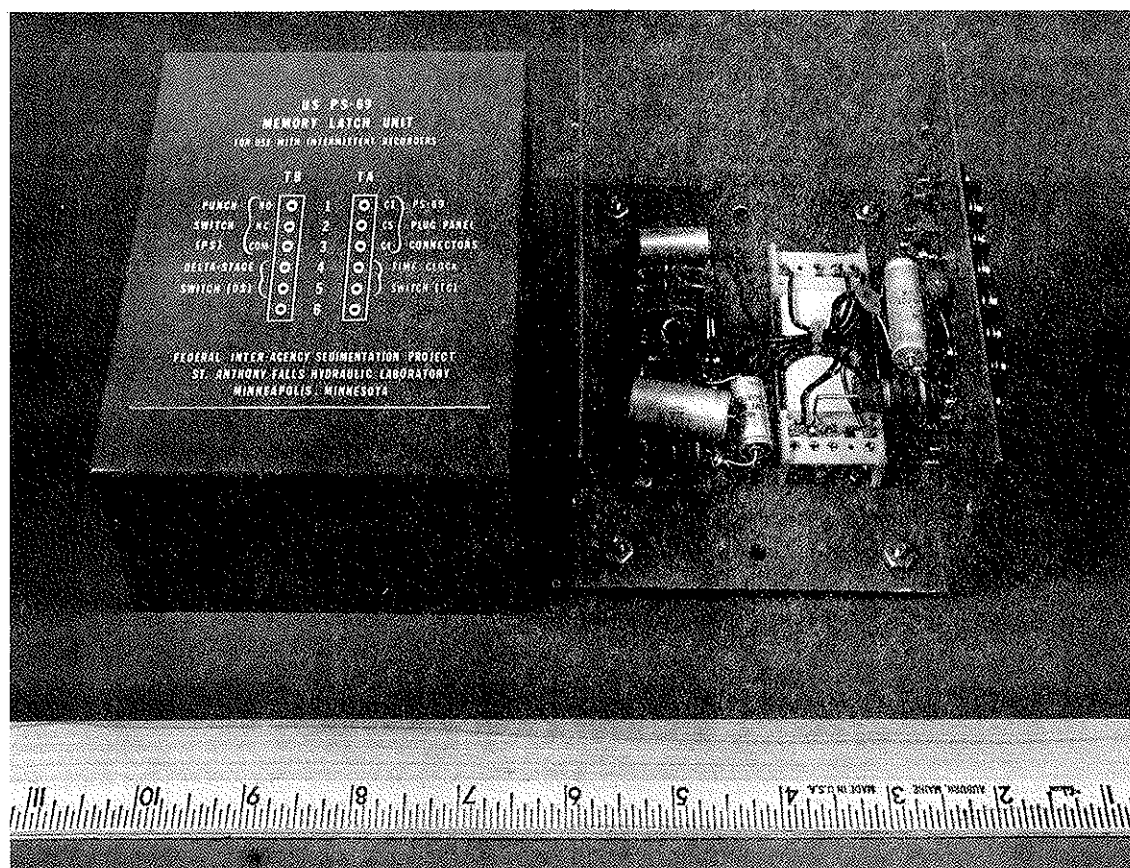


Figure 1. MEMORY LATCH, US ML-73

—PHYSICAL CHARACTERISTICS—

Length = 5" (12.7 cm)
Width = 4" (10.2 cm)
Height = 3" (7.6 cm)
Weight = 1 3/4 lbs. (0.8 kg)
Shipping weight = 2 lbs. (0.9 kg)

—SHIPPING INFORMATION—

Box dimensions = 6 1/4 x 5 1/2 x 7 1/2 in.
(15.9 x 14 x 19 cm)
Box volume = 0.15 ft³ (0.05 m³)

PS-69 Plastic trays, US PTH-69

These trays hold 12 quart containers for the PS-69 pumping sampler. Six trays are supplied with each sampler, which fills the sampler's drawer. The trays allow easy removal of sample containers.

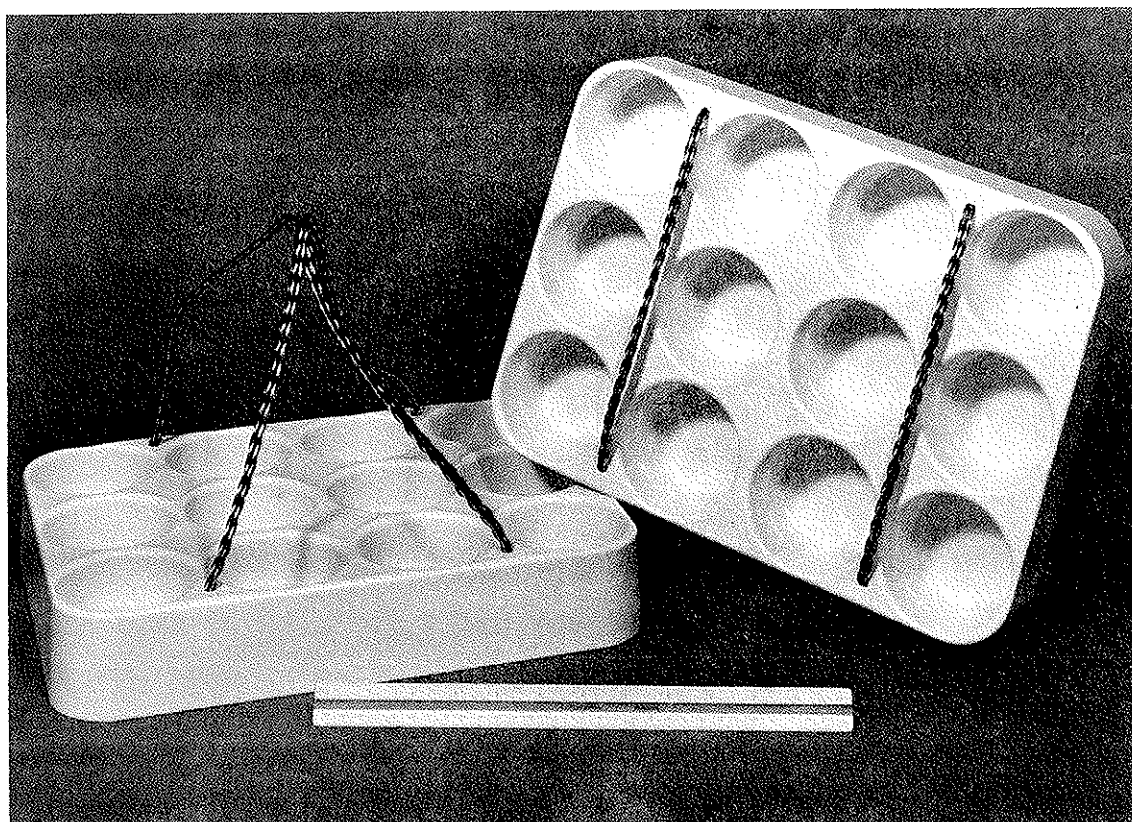


Figure 1. PS-69 PLASTIC TRAYS, US PTH-69

—PHYSICAL CHARACTERISTICS—

Height = 2 1/2" (6.4 cm)
Width = 14 5/8" (37.1 cm)
Depth = 11" (27.9 cm)
Weight (singly) = 2 lbs. (0.9 kg)
Shipping weight (set of 6) = 10 lbs. (4.5 kg)

—SHIPPING INFORMATION—

Box dimensions = 16 3/4 x 13 x 17 in.
(42.6 x 33.0 x 43.2 cm)
Box volume = 2.14 ft³ (0.65 m³)

Shipping container, US SC-73

The US SC-73 is a plywood box filled with a 12-cavity styrofoam liner that will accept either pint or quart glass containers and plastic quart containers (container choice must be stated at time of order). The box sides are 3/8-inch marine plywood and top and bottom are 1/2-inch marine plywood. The box is secured with 1/2-13 stainless steel lock nuts. The label holder is spring loaded for quick change of address. The production model may be slightly different from that pictured. The overall weight, exclusive of containers, is approximately 13-pounds. A photograph of the SC-73 is shown in figure 1.

—PHYSICAL CHARACTERISTICS—

Box height = 10" (25.4 cm)
Box length = 19 1/2" (49.5 cm)
Box width = 13 3/4" (34.9 cm)
shipping weight = 13 lbs. (5.9 kg)
shipping volume = 1.6 ft³ (0.49 m³)

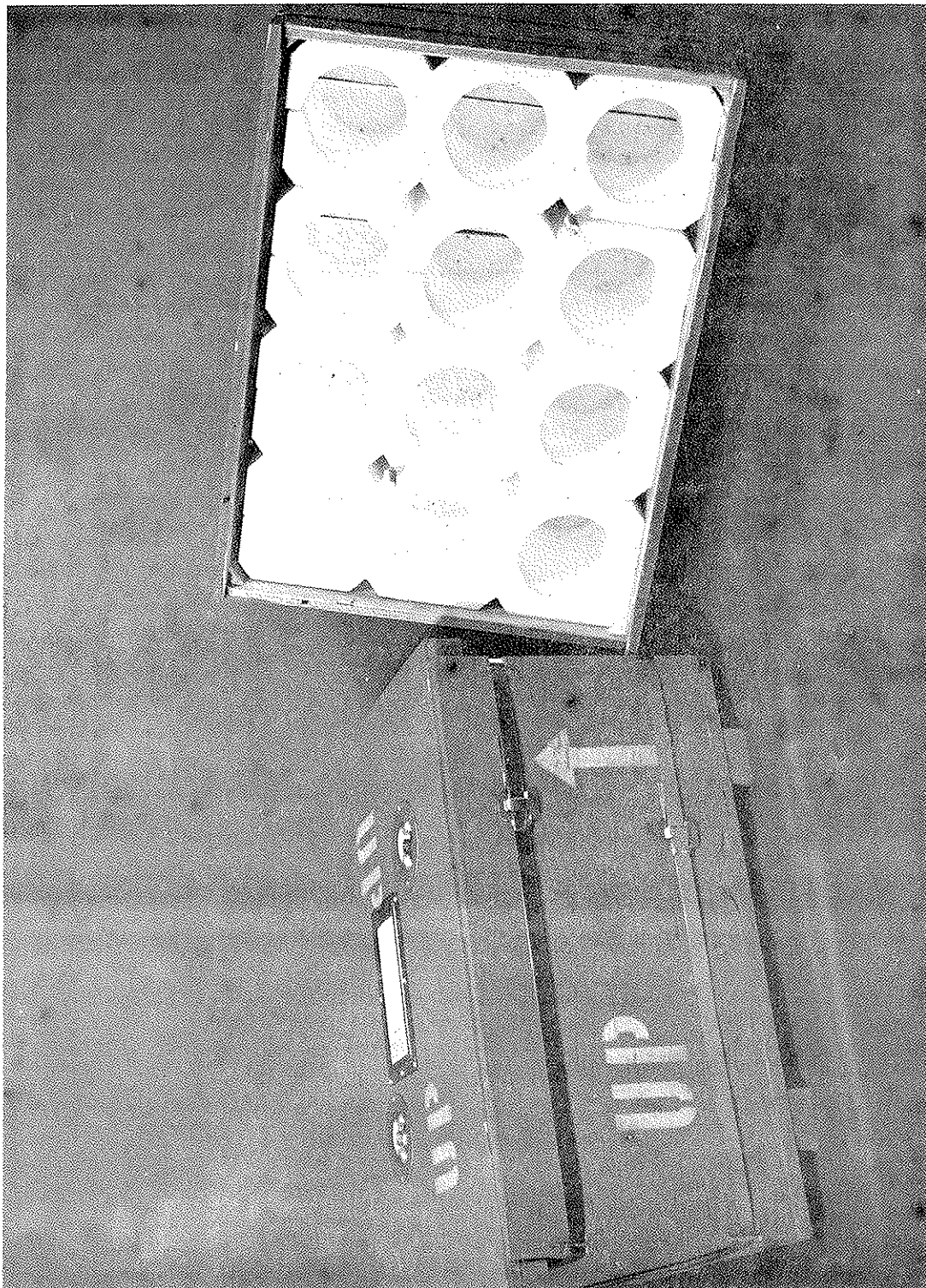


Figure 1. SHIPPING CONTAINER, US SC-73

Time Clocks, TC-76 and TC-77

The TC-76 Time Clock is a solid-state interval timer designed to activate the PS-69 pumping sampler. The TC-76 operates from the 36-volt d.c. supply for the PS-69. The accuracy of the clock is dependent primarily on temperature and supply voltage variations, having approximately the accuracy of a mechanical watch. The TC-76 will set the sampling interval at either a high-speed rate or a low-speed rate. Intervals within each rate can be manually adjusted. Switching between rates can be performed manually or automatically. In the low-speed rate, sampling intervals can be set at steps from 0.75 to 24 hours between samples. When a terminal on the front panel of the clock is grounded, the clock will switch to the high-speed rate and sampling intervals can be set at steps between 2.8 and 90 minutes. The terminal can be grounded manually or through the use of a float switch. An indicator light and test switch provide a means of quickly checking the time clock's operation. The test switch speeds up the timer to observe its operation without waiting long periods of time.

The TC-77 is a 12-volt version of the TC-76. It operates in the same manner and is built into the same box size. It will start a Chickasha sampler.

—PHYSICAL CHARACTERISTICS—

Overall height = 3" (7.6 cm)
Width = 5" (12.7 cm)
Depth = 3 3/4" (9.5 cm)
Weight = 1 lb. (0.45 kg)
Shipping weight = 2 lbs. (0.9 kg)

—SHIPPING INFORMATION—

Box dimensions = 17 x 13 1/2 x 12 in.
(43.18 x 34.29 x 30.48 cm)
Box volume = 1.6 ft³ (0.49 m³)

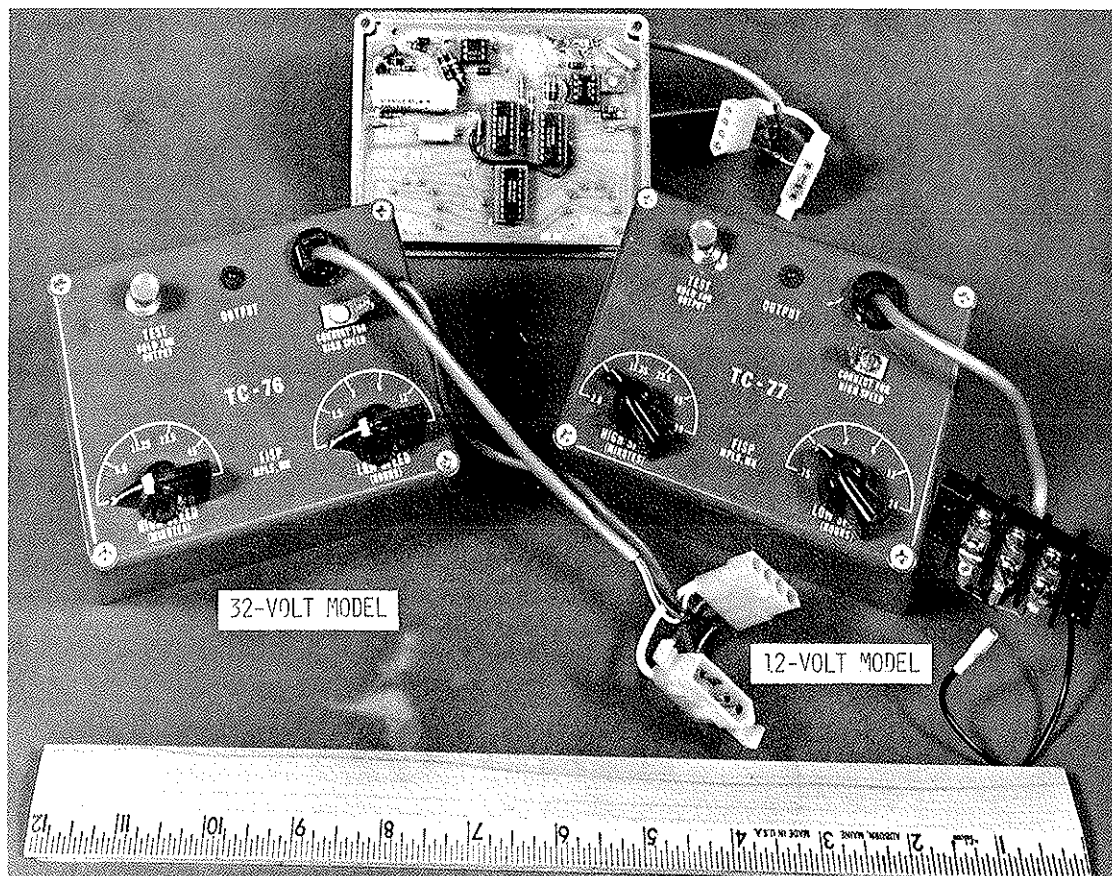


Figure 1. TIME CLOCKS, TC-76 AND TC-77

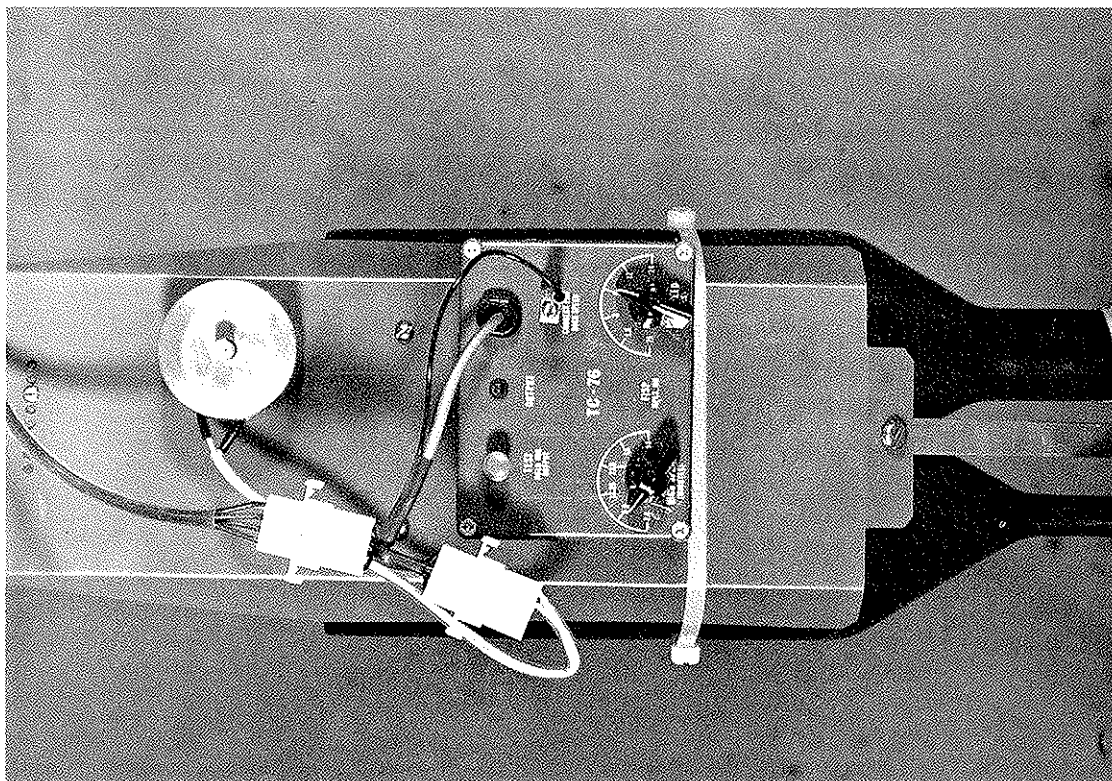


Figure 2. MOUNTED TIME CLOCK, TC-76

Float Switch

These switches are used to sense a water level, whether in a stream, a well, or in a backflush barrel. Several types have been used in the past and it's likely more designs will be used in the future. The photo shows two types in current use. On the left is a commercially produced type using a pivoted floating magnet to operate a reed switch. On the right is an older type, a commercial mercury switch imbedded in a block of plastic foam. The choice of foam can be critical, as some plastic foams are degraded by sunlight or trace quantities of oils or gasoline.

These are a replacement item.

Note: Physical shape and design may vary from one production to another.

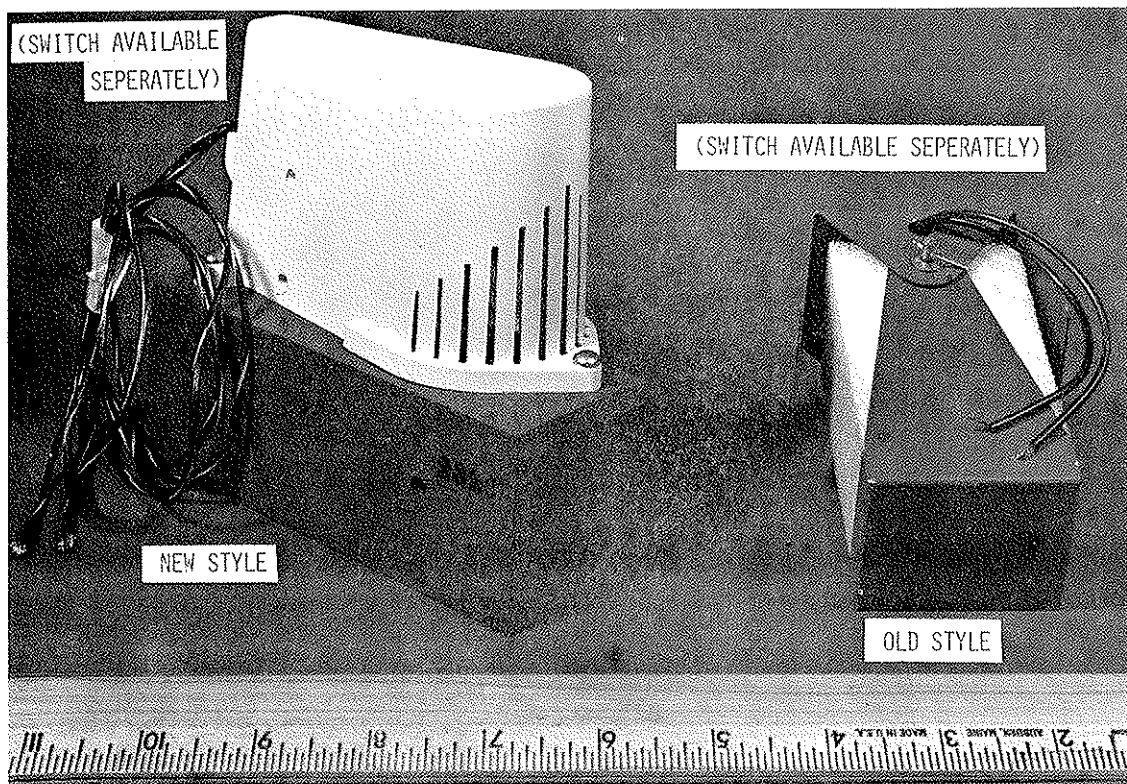


Figure 1. FLOAT SWITCHES

—PHYSICAL CHARACTERISTICS—

Floating switch in left of photo:

Height = 5" (12.7 cm)

Width = 5 1/2" (14 cm)

Depth = 2 5/8" (6.7 cm)

Weight = 1 1/2 lbs. (0.7 kg)

Shipping weight = 2 1/2 lbs. (1.1 kg)

Floating switch in right of photo:

Height = 3 3/4" (9.5 cm)

Width = 2 3/4" (7 cm)

Depth = 2 1/4" (5.7 cm)

Weight = 1 lb. (0.45 kg)

Shipping weight = 2 lbs. (0.9 kg)

—SHIPPING INFORMATION—

Box dimensions = 17 x 13 1/2 x 12 in.

(43.18 x 34.29 x 30.48 cm)

Box volume = 1.6 ft³ (0.49 m³)

Jabsco Water Puppy

The Jabsco pump is primarily used as the backflush pump for the PS-69. It is available in various voltages. The PS-69 takes the 32-volt model. It is a self-priming pump and has a garden hose and standard pipe thread connections at both inlet and outlet extremities. There is also a repair kit for this pump which consists of a rotor, gasket and washer, figure 1. A photograph of the pump (along with the 1/3 horsepower motor and IP555 pump) is shown in figure 2.

PHYSICAL CHARACTERISTICS

Length = 6" (15.2 cm)
Width (base) = 4" (10.2 cm)
Height = 3 1/4" (8.26 cm)
Approximate weight = 4 1/2 lbs. (2.04 kg)
Shipping weight = 5 lbs. (2.27 kg)

SHIPPING INFORMATION

Box dimensions = 15 x 12 x 10 1/2 in.
(38.1 x 30.4 x 26.7 cm)
Box volume = 1.09 ft³ (0.33 m³)

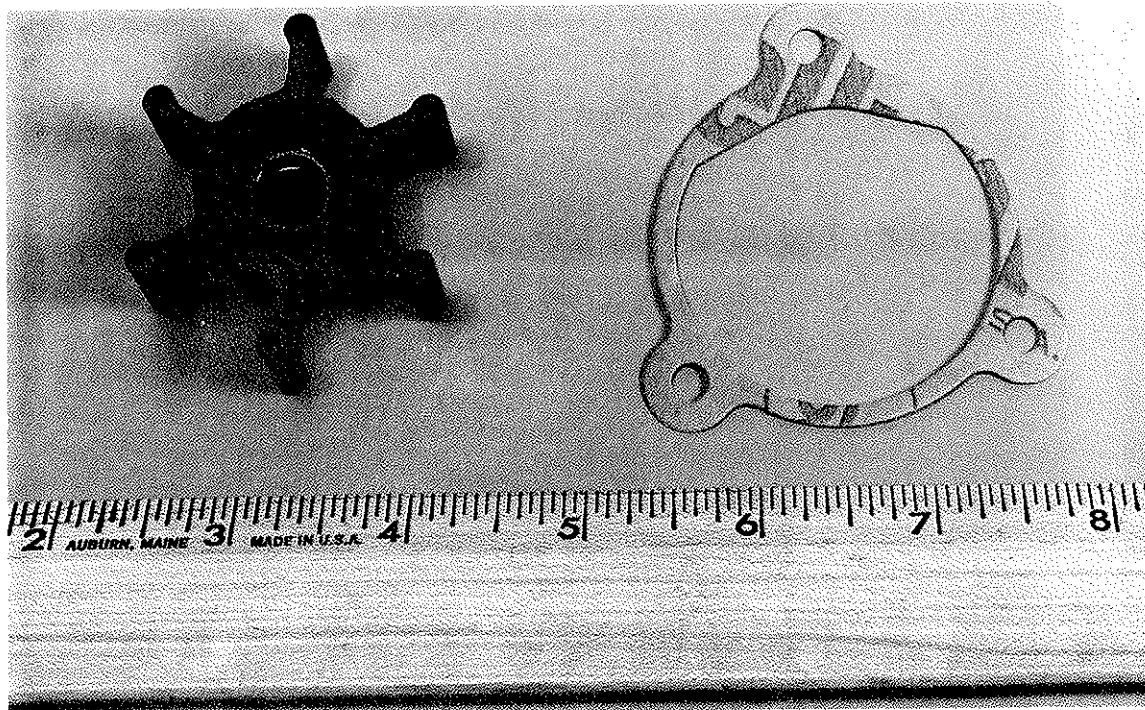


Figure 1. JABSCO WATER PUPPY PUMP REPAIR KIT

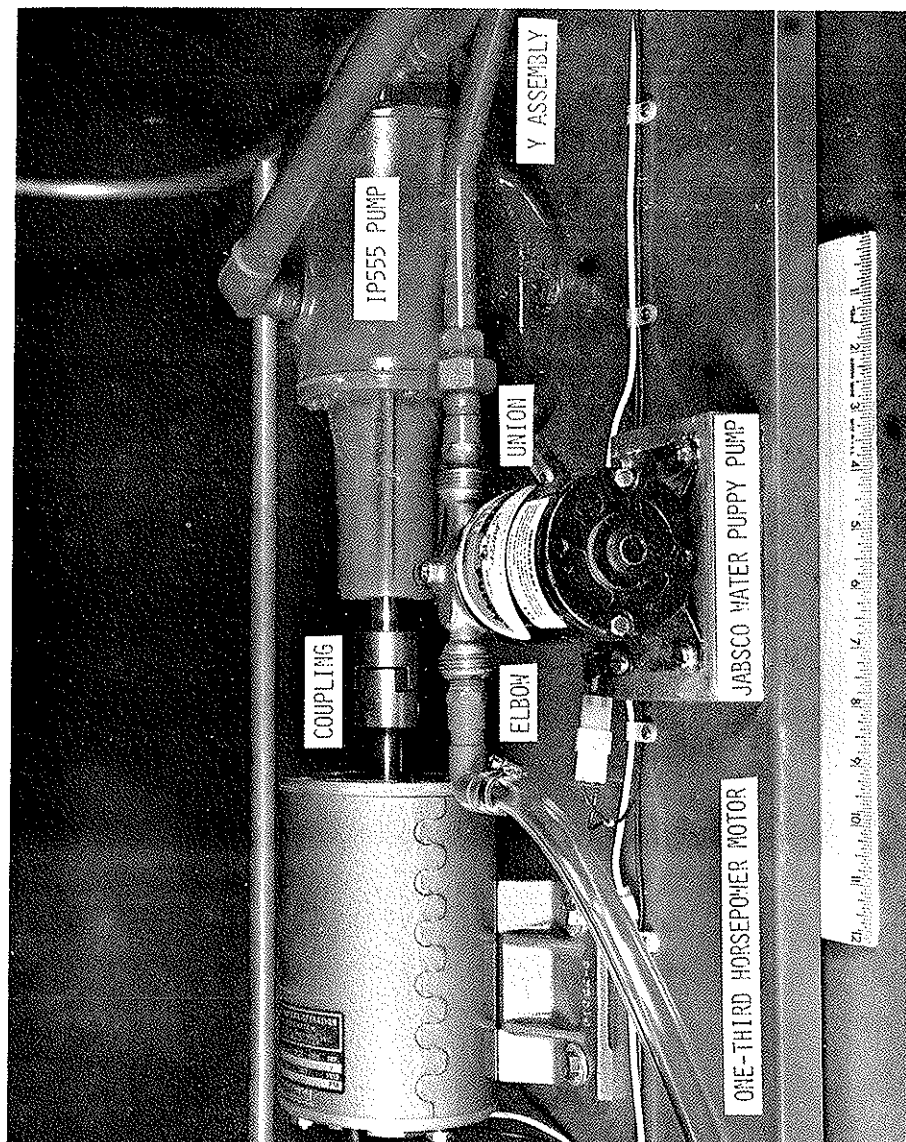


Figure 2. PS-69 WATER SUPPLY

One-third Horsepower motor

The one-third horsepower motor is used with the rotary screw pump on the PS-69. This permanent-magnet, direct current motor will provide all the power necessary to drive the rotary pump. It is secured by four 3/8" screws. The shaft length is 1 3/4". When ordering the motor, make arrangements for getting a coupling. A photograph of the motor (along with the Jabsco Waterpuppy motor and the IP555 pump) is shown in figure 1.

—PHYSICAL CHARACTERISTICS—

Length = 9" (22.9 cm)
Width (base) = 6 1/2" (16.5 cm)
Height = 5 3/4" (14.6 cm)
Approximate weight = 16 lbs. (7.26 kg)
Shipping weight = 20 lbs. (9.07 kg)

—SHIPPING INFORMATION—

Box dimensions = 15 x 12 x 10 1/2 in.
(38.1 x 30.4 x 26.7 cm)
Box volume = 1.09 ft³ (0.33 m³)

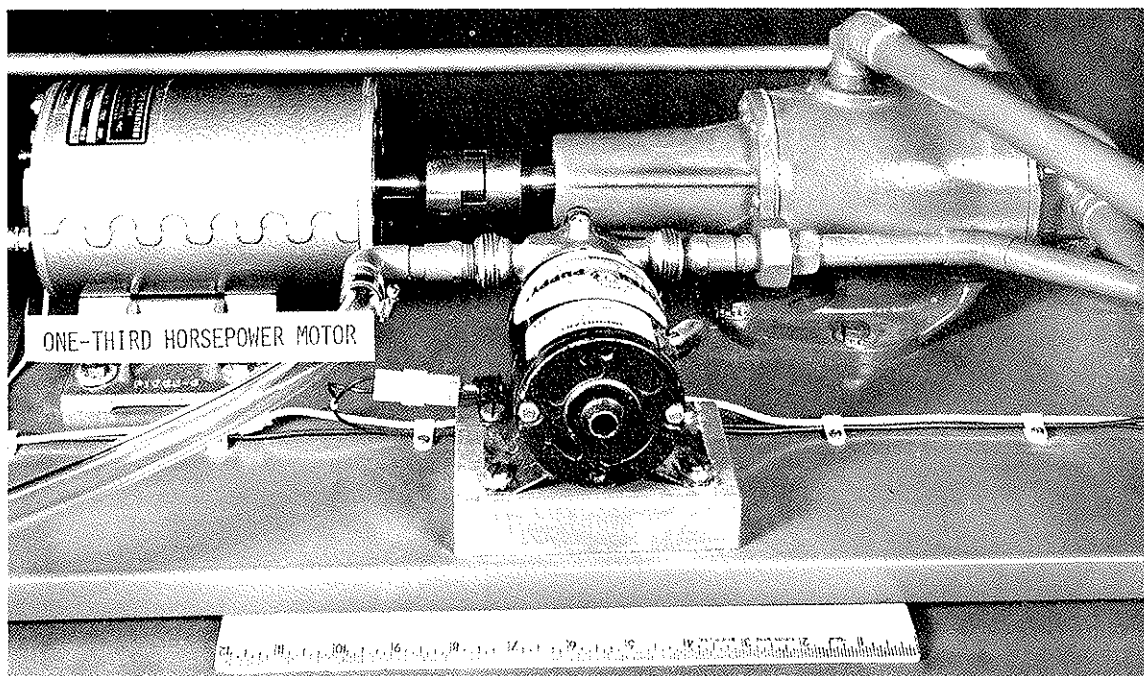


Figure 1. PUMP ASSEMBLY

Main sampling pump, IP555

This is a progressive-cavity, positive-displacement pump. A bent steel shaft (rotor) rotates within a rubber stator, forcing the liquid along. The pump will lift about 20 feet when new and push the fluid about 80 feet with sufficient velocity in a 3/4-inch line to minimize deposition. Its primary use is on the PS-69 pumping sampler.

The pump consists of two main castings: the body and end bell. Replacement parts in stock include rotors, stators, and end bells. A photograph is shown in figure 1.

—PHYSICAL CHARACTERISTICS—

Overall length = 13 1/2" (34.4 cm)
Width = 4 1/4" (10.8 cm)
Height = 5 3/8" (13.7 cm)
Weight = 7 1/2 lbs. (3.4 kg)
Shipping weight = 8 lbs. (3.6 kg)

—SHIPPING INFORMATION—

Box dimensions = 13 3/4 x 6 1/4 x 5 1/4"
(34.9 x 15.9 x 13.3 cm)
Box volume = 0.3 ft³ (0.09 m³)

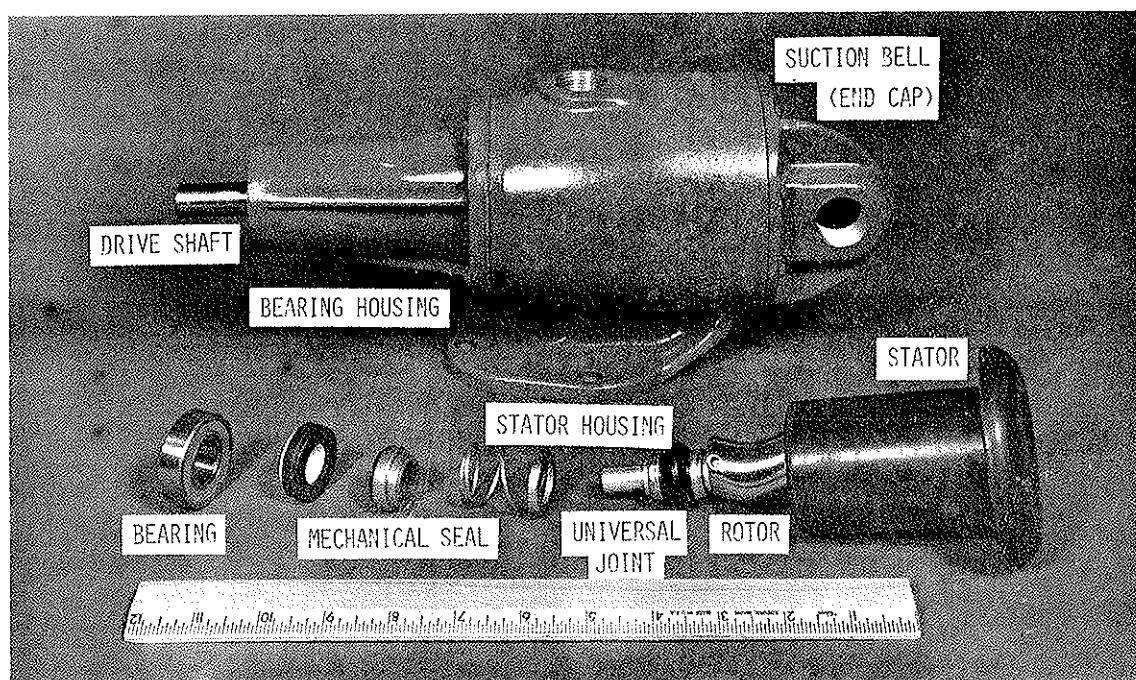


Figure 1. MAIN SAMPLING PUMP, IP555

Stacom Manometer

This device is a river-stage switch assembly for the bubbler-gage manometer. It is used to activate a pumping sampler when the river rises to a predetermined level. As many as three switches have been installed at various levels, but only one switch and bracket are furnished.

—PHYSICAL CHARACTERISTICS—

Shipping weight = 5 lbs. (2.3 kg)

Box dimensions = 18 3/4 x 12 3/4 x 7 1/4 in.

(47.6 x 32.4 x 18.4 cm)

Box volume = 1.0 ft³ (0.31 m³)

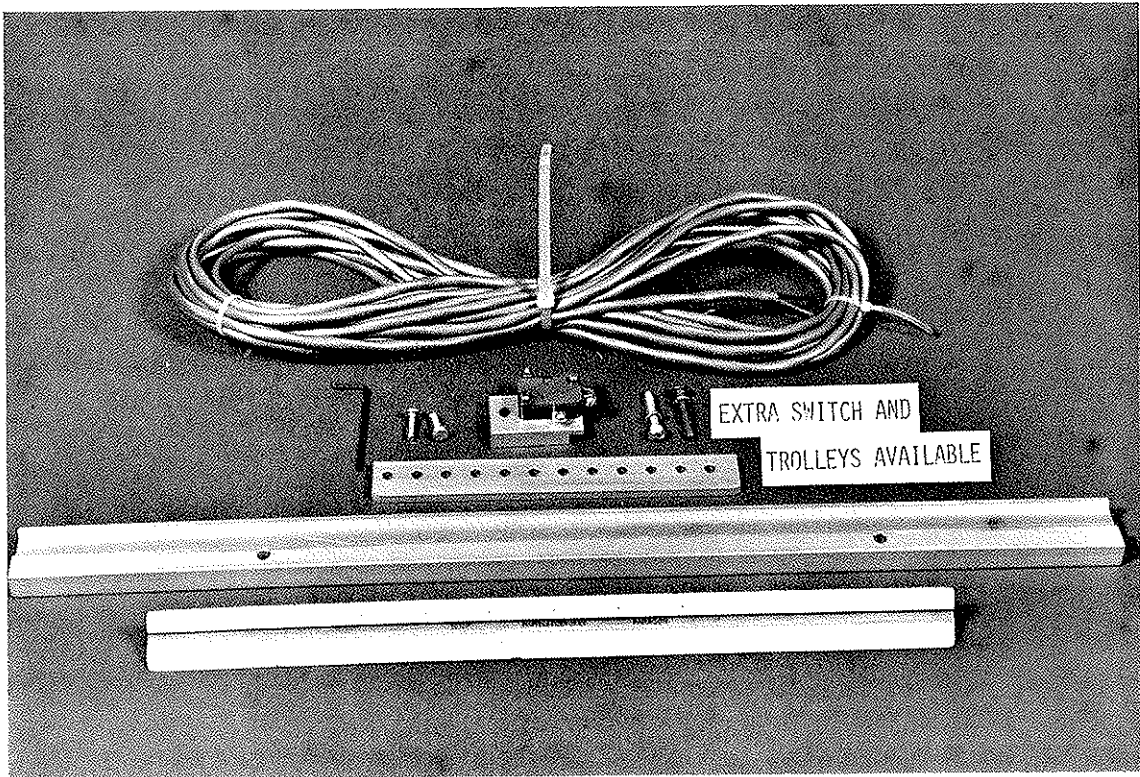


Figure 1. STACOM MANOMETER

Chickasha pumping sampler, US CS-77

This automatic pumping sampler was designed by personnel of the USDA in Chickasha, Oklahoma, for use on small watersheds. The sampler holds 28 pint bottles and is powered by a 12-volt auto battery. Once activated, the machine pumps for about one-minute before diverting the flow into a bottle. There is no flush cycle. A photograph of CS-77 is shown in figure 1.

—PHYSICAL CHARACTERISTICS—

Height = 3'8" (111.8 cm)
Width = 3'8" (111.8 cm)
Depth = 3 ft. (91.4 cm)
Weight = 167 lbs. (75.91 kg)
Shipping weight = 250 lbs. (113.64 kg)

—SHIPPING INFORMATION—

Box dimensions = 3'11" x 3'1" x 4 ft.
(119.4 x 94 x 121.9 cm)
Box volume = 48.3 ft³ (1.36 m³)

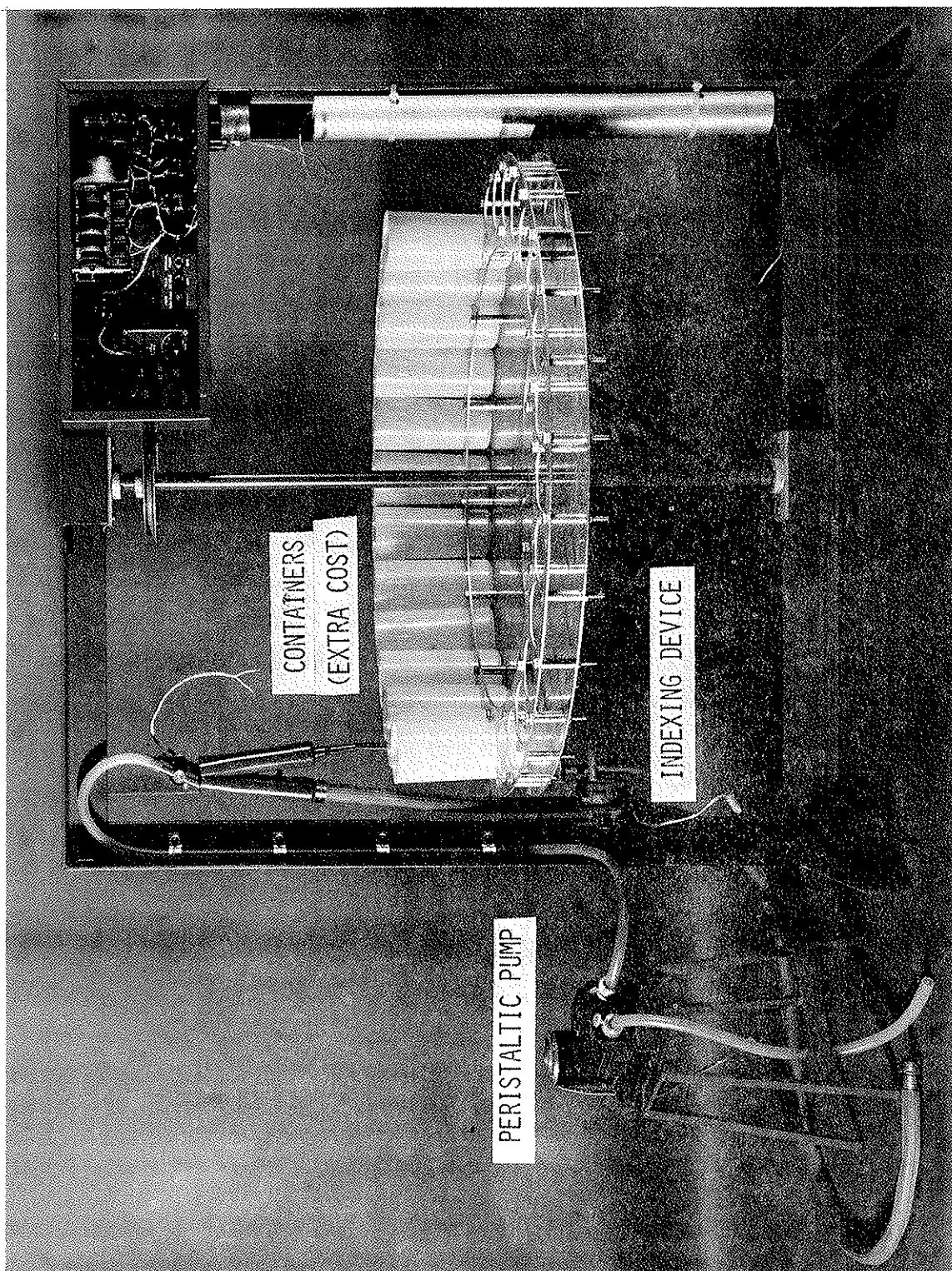


Figure 1. CHICKASHA PUMPING SAMPLER, US CS-77

Chickasha control box, US CB-77

The chickasha control box is the device that programs the complete sequence of events on the chickasha pumping sampler (US CS-77). The device has three main parts. The first part is the TC-77 interval timer, described elsewhere in this catalog. The timer starts the sampler at preset intervals from 2.8 minutes to 24 hours. The second part is a sequence step-timer driven by a 12-volt dc motor. The third part is a small control plate allowing for water pumping on demand and a water-level switch bypass. The sampler itself requires very little energy, but the loads it actuates require the control box to be actuated by a heavy duty 12-volt car battery. The front of the control box is a piece of clear plastic which allows the operator to observe whether the unit is functioning. It is shipped ready to operate from a 12-volt dc power source (not included).

—PHYSICAL CHARACTERISTICS—

Overall height = 8" (20.3 cm)
Width = 5" (12.7 cm)
Length = 18" (45.7 cm)
Weight = 12 lbs. (5.4 kg)
Shipping weight = 19 lbs. (8.6 kg)

—SHIPPING INFORMATION—

Box dimensions = 15 x 12 x 10 1/2 in.
(38.1 x 30.4 x 26.7)
Box volume = 1.09 ft³ (0.33 m³)

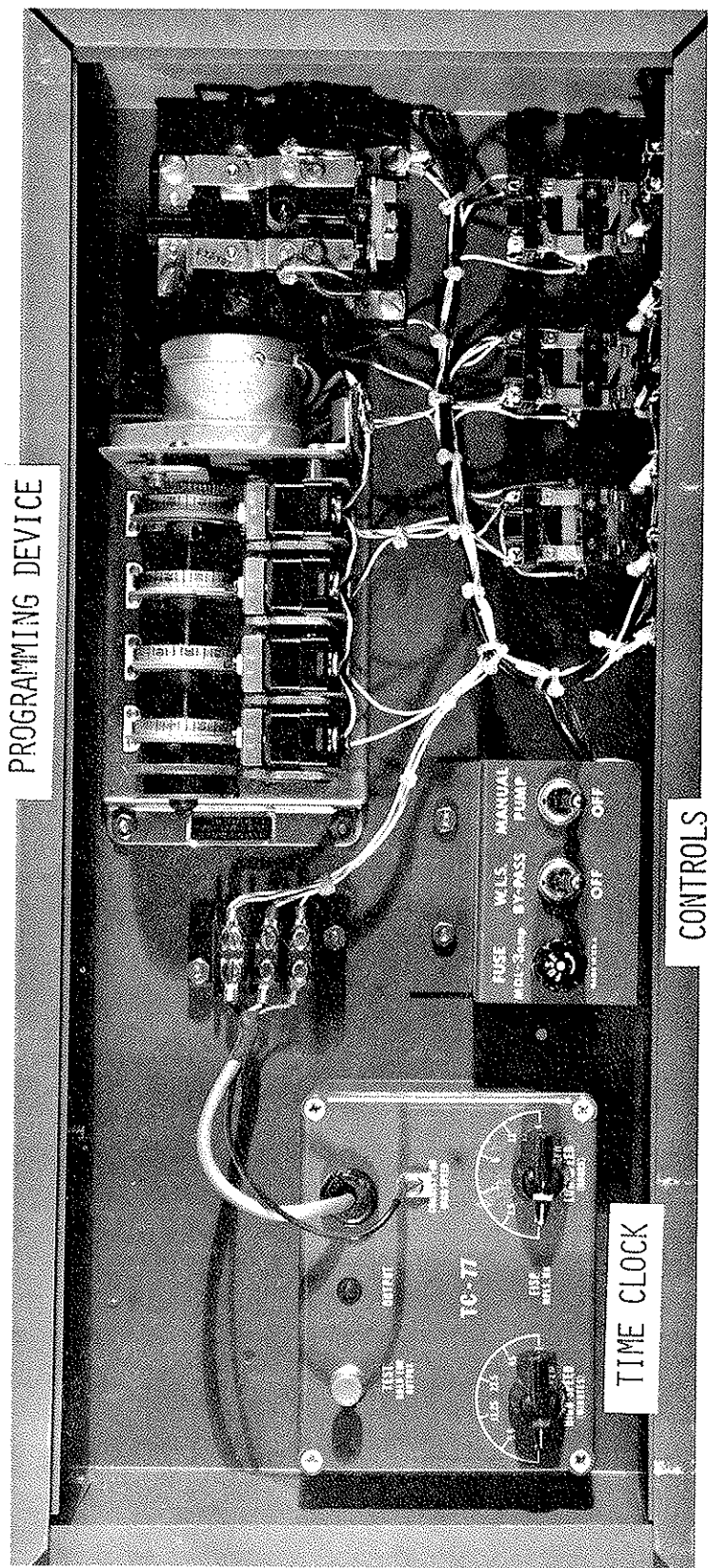


Figure 1. CHICKASHA CONTROL BOX, US CB-77

Peristaltic Pump, US RP-77

The peristaltic pump, RP-77, was designed to pump samples for analysis of suspended fluvial sediment. Samples contact only the walls of a silicone-rubber tube so contamination by trace quantities of metals is minimized. The tubing remains flexible at low temperatures so if water within the pump freezes no structural damage will result. The pump can be operated in any position and is self-priming for suction lifts less than approximately 18 feet. The D.C. 36-volt motor (1/12 HP) requires less than 70 watts so it can be operated from batteries for sustained periods.

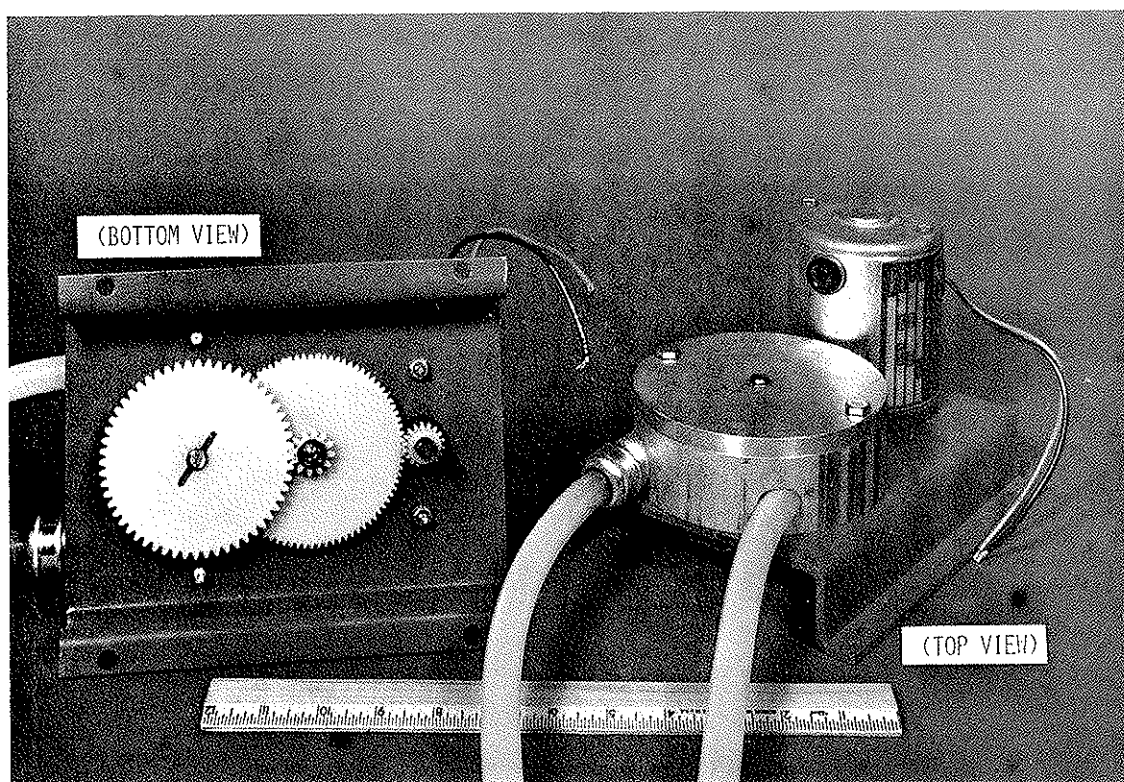


Figure 1. PERSTALTIC PUMP, US RP-77

—PHYSICAL CHARACTERISTICS—

Length (without hoses) = 9" (22.9 cm)
Width = 7 1/4" (18.4 cm)
Height = 6 " (15.2 cm)
Shipping weight = 16 lbs. (7.3 kg)
Weight = 12 1/2 lbs. (5.7 kg)

—SHIPPING INFORMATION—

Box dimensions = 15 x 12 x 10 1/2 in.
(38.1 x 30.4 x 26.7 cm)
Box volume = 1.09 ft³ (0.33 m³)

Pumping-type bottling sampler, US PS-82

The US PS-82 is a light-weight, portable automatic pumping sampler for use in streams carrying suspended sediment. The sampler can collect 24 one-pint samples over a wide range of time intervals. Sampling can also be increased or curtailed in response to change in stage.

The PS-82 is mechanically simple in design. The solid-state control board and timer board are readily detachable for ease of maintenance.

The single 12-volt battery can be of several different sizes. The largest, a utility-size battery, can be used to collect up to 10 or 12 sets of samples.

The pump can be used to collect trace-metal samples. It can be separated from the PS-82 or be used in pairs to overcome some lift restrictions.

Simple shelters may be used, such as a heavy-duty plastic bag or a 55-gallon oil drum. The shelter need not be heated during light freezes. This is due to the backflush purging of the tubing and because the sample containers are freeze resistant.

Sample containers are flat-bottomed cylinders which simplifies sediment removal. Two types of caps are available: one for the gentle transportation of bottles and one which can withstand rougher conditions.

PHYSICAL CHARACTERISTICS

Overall height	=	37.5 inches (17 cm)
Width	=	22 inches (9.6 cm)
Depth	=	22 inches (9.6 cm)
Weight	=	56 pounds (25.4 kg)
Shipping weight	=	58 pounds (26.3 kg)

SHIPPING INFORMATION

Barrel dimensions	=	22" diameter x 34" long
		(9.6 diameter x 86.4 cm)
Barrel volume	=	2.38 ft ³ (1990 cm ³)

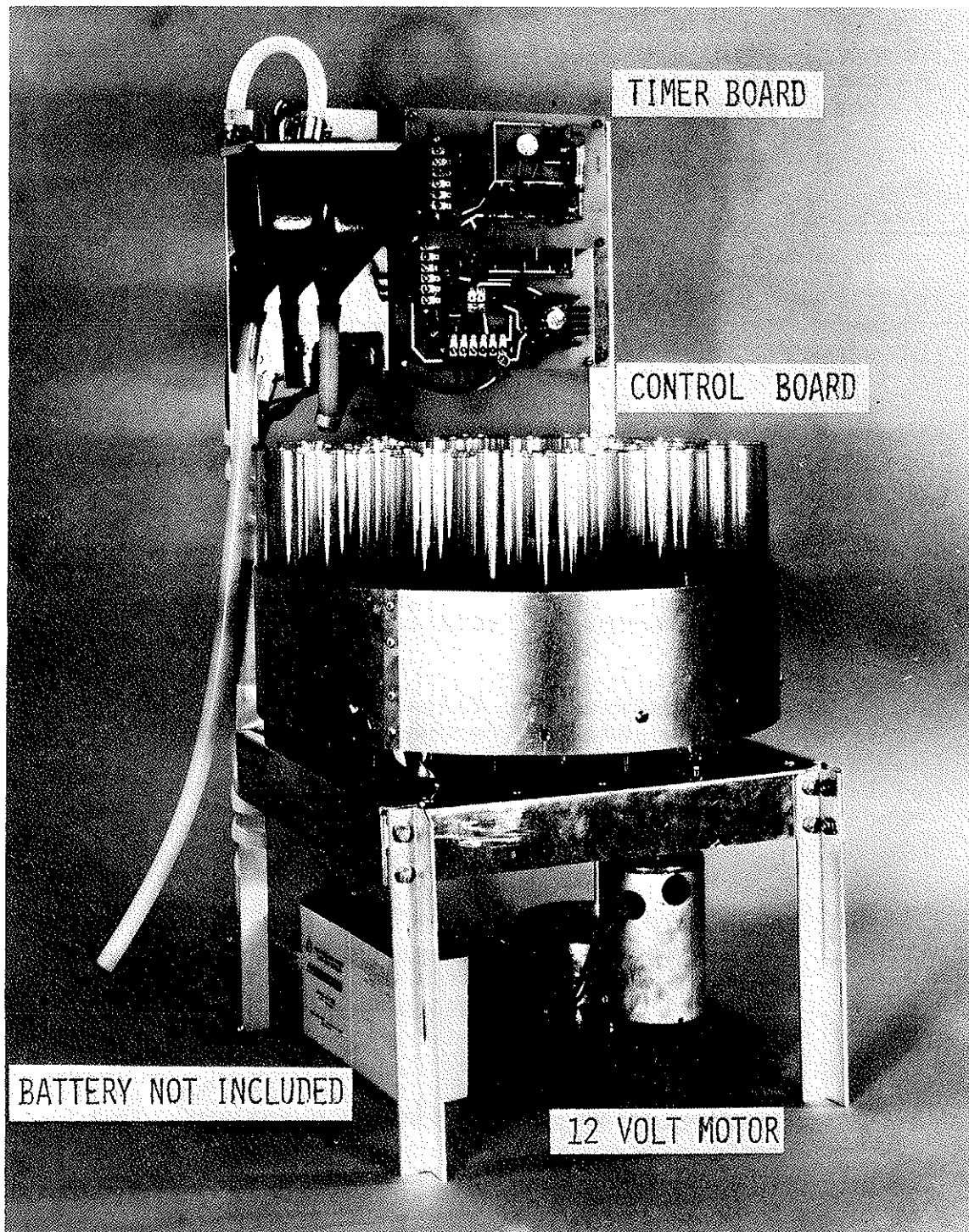


Figure 1. Pumping-type bottling sampler, US PS-82

Piston-type bed-material hand sampler, US BMH-53

This sampler is used to collect a sample of material from the bed of a shallow stream which may be waded. The overall length of the sampler which is tubular, is 46 inches.

The lower end of the sampler contains a cylinder 2 inches in diameter and 8 inches long which is pressed into the stream bed to collect the sample. A handle for pressing the cylinder into the bed is on the upper end, and passes through the sampler frame to the piston inside. The suction created by the piston holds the sample in the cylinder. The sample is pushed out of the cylinder by the piston. The sampler is shown in figures 1 and 2.

This sampler will not work for some bed materials, such as coarse sands and gravels.

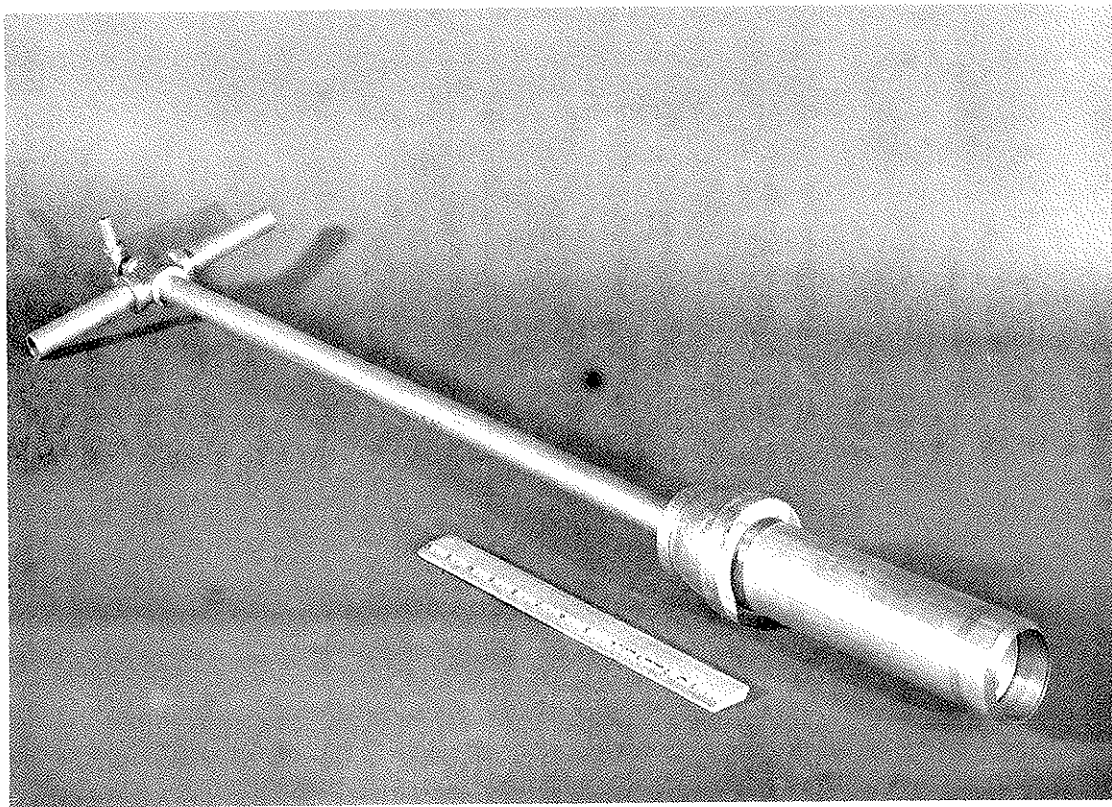


Figure 1. PISTON-TYPE BED-MATERIAL HAND SAMPLER, US BMH-53

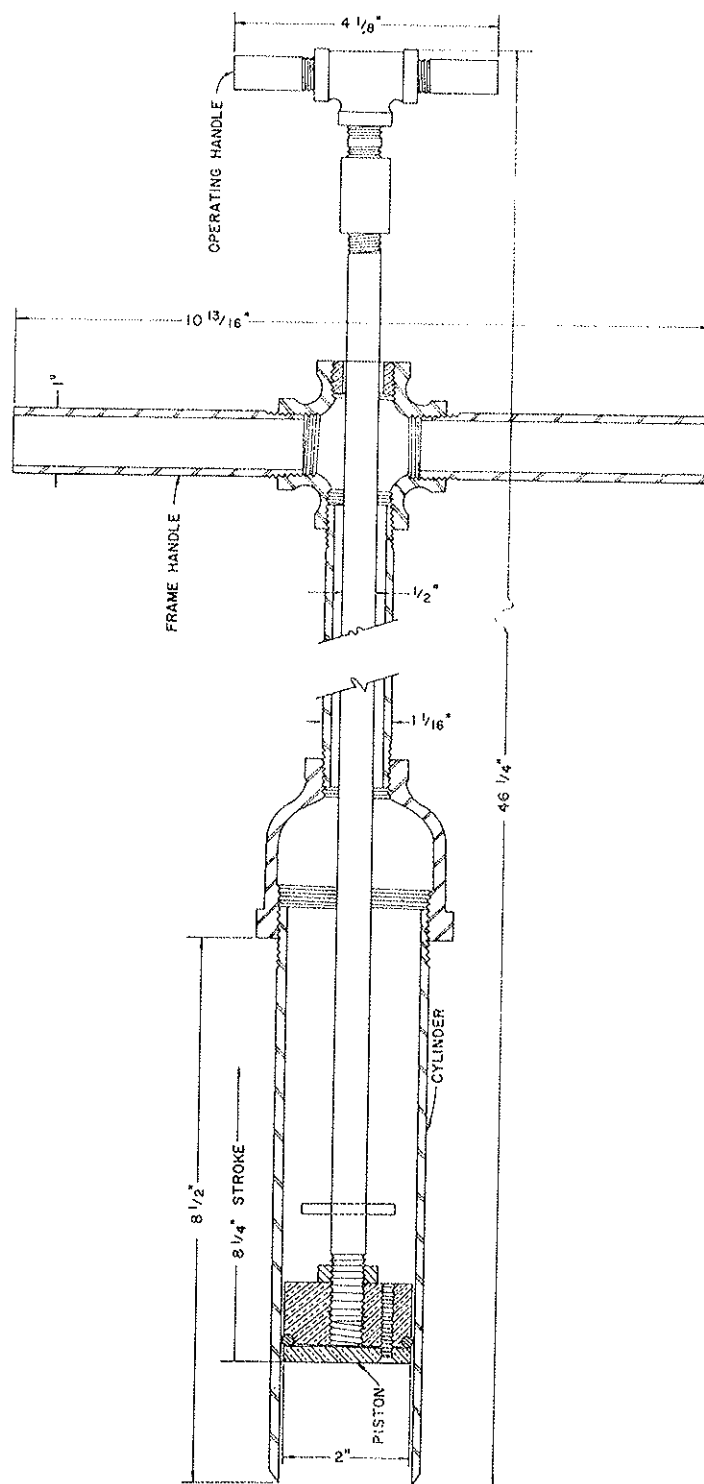


Figure 2. PISTON-TYPE BED-MATERIAL HAND SAMPLER, US BMH-53

—PHYSICAL CHARACTERISTICS—

Overall length = 46" (116.8 cm)

Approximate depth = 2 3/8" (6 cm)

Approximate width = 11" (27.9 cm)

Weight = 7 1/2 lbs. (3.4 kg)

Shipping weight = 8 1/2 lbs. (3.9 kg)

Note: Shipped without box

Hand-line bed-material sampler, US BMH-60

This is a 32-pound sampler used to collect samples from the bed of a stream, lake, or a reservoir. Penetration into the bed material is approximately 1.7 inches. The sampler can be suspended from a flexible line and lowered and raised by hand power. The weight of the sampler limits its use to tranquil streams and moderate or slightly compacted bed materials.

The body of the sampler is made of aluminum, is equipped with tail vanes and is approximately 22-inches long. Ballast makes the sampler nose heavy by about four pounds to assist the sampling bucket mechanism in penetrating the bed material of the stream. The sampling bucket accommodates about 175 cc of material and is spring loaded by crosscurved, constant-torque, motor-type springs. When the sampler is supported by the hand suspension line or whenever the safety yoke is in place on the grooved hanger, the bucket may be cocked to the open position by means of a wrench; i.e., the bucket is fully retracted within the body shell of the sampler and ready to take a sample when released. As long as the safety yoke is in place on the hanger, the bucket mechanism cannot be released. However, with the safety yoke removed and the sampler supported by the hand line, the spring loaded cocking device will release the bucket mechanism when the sampler rests on the bottom of the stream. The bucket in closing penetrates the stream bed and completely encloses a sample of the bed material. Gaskets prevent loss or contamination of the trapped sample. When the sampler has been recovered from the stream, the bed material sample can be removed, transferred and packaged for shipment. Photographs and a diagram of the US BMH-60 are shown in figures 1, 2 and 3.

PHYSICAL CHARACTERISTICS

Overall length = 22" (55.9 cm)
Width of body = 4 3/8" (11.1 cm)
Height at tail = 8 1/8" (20.6 cm)
Weight = 32 lbs. (14.5 kg)
Shipping weight = 54 lbs. (24.5 kg)

SHIPPING INFORMATION

Box dimensions = 27 x 9 x 12 1/2 in.
(68.6 x 22.9 x 31.8 cm)
Box volume = 1.76 ft³ (0.54 m³)

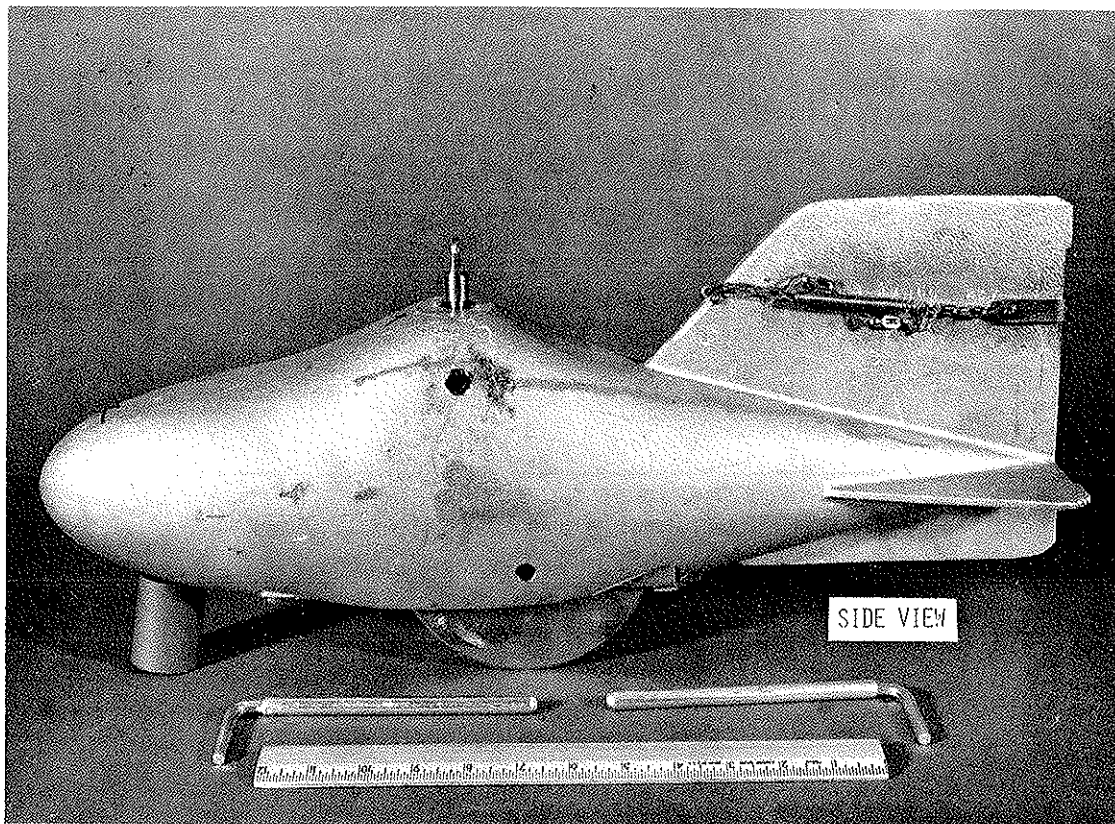


Figure 1. HAND-LINE BED-MATERIAL SAMPLER, US BMH-60

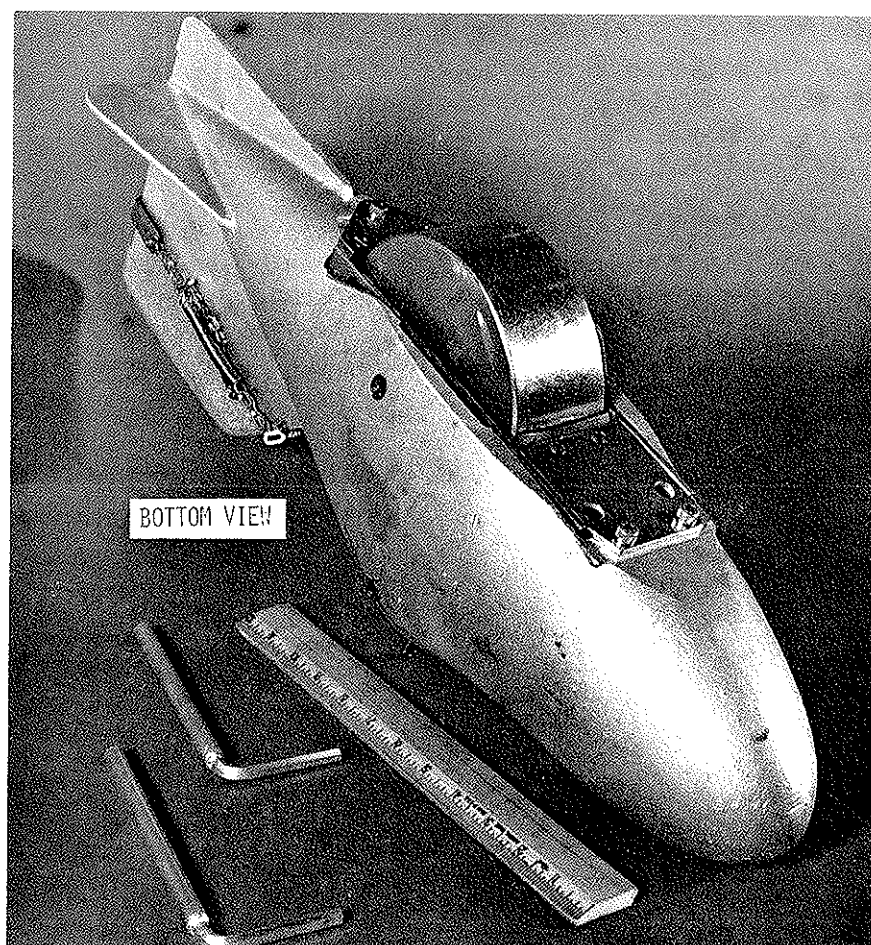


Figure 2. HAND-LINE BED-MATERIAL SAMPLER, US BMH-60

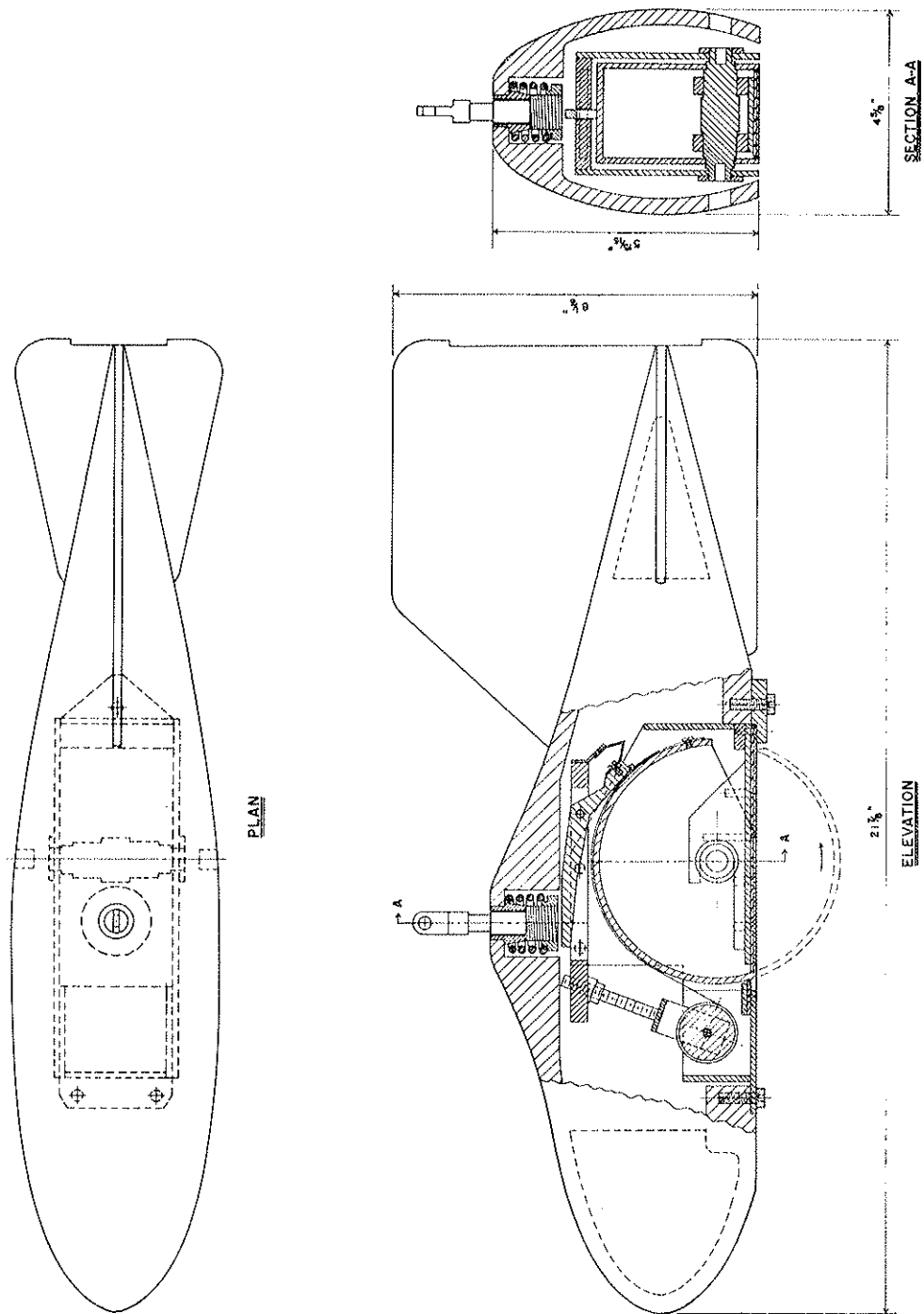
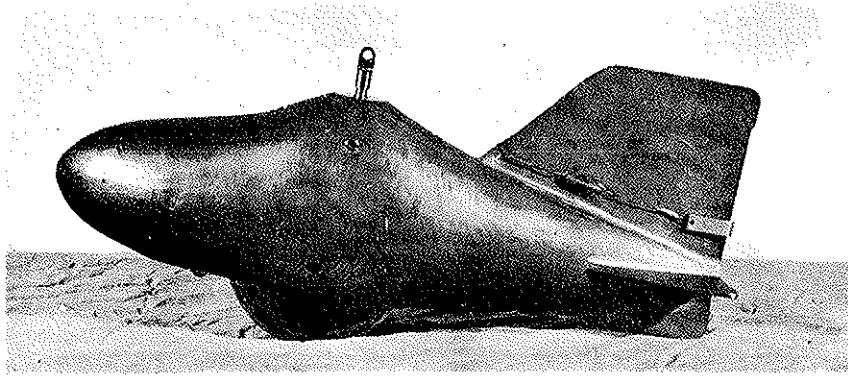
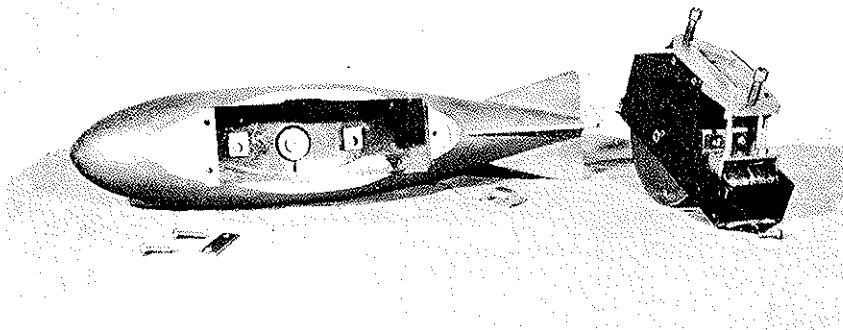


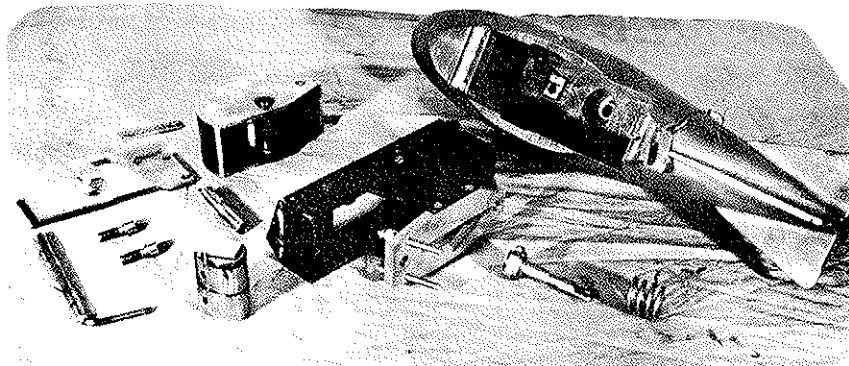
Figure 3. HAND-LINE BED-MATERIAL SAMPLER, US BMH-60



Side view



Bottom view of sampler body with sampling bucket and mechanism assembly removed and shown at right.



Mechanism dismantled showing sampler bucket at upper left of photo.

Bed-material sampler, US BM-54

This is a 100-pound sampler used to collect samples from the bed of a stream or reservoir of any depth.

The sampler is made of cast iron, is equipped with tail fins, and is 22-inches long. When the sampler is supported by a steel cable the bucket may be cocked by means of wrench, i.e., set in the open position, for taking a bed-material sample. When tension on the cable is released by resting the sampler on the stream bed, the bucket snaps shut taking a sample. The sample is collected from the top 2 inches of a stream bed, in a single scoop-type bucket that swings out of the bottom of the sampler body. The bucket surrounds and encloses the sample in such a way that it is not washed out when the sampler is raised to the water surface. The sampler is shown in figures 1, 2, 3, and 4.

Information on operation and maintenance of the sampler is found in Report M which is furnished with each sampler.

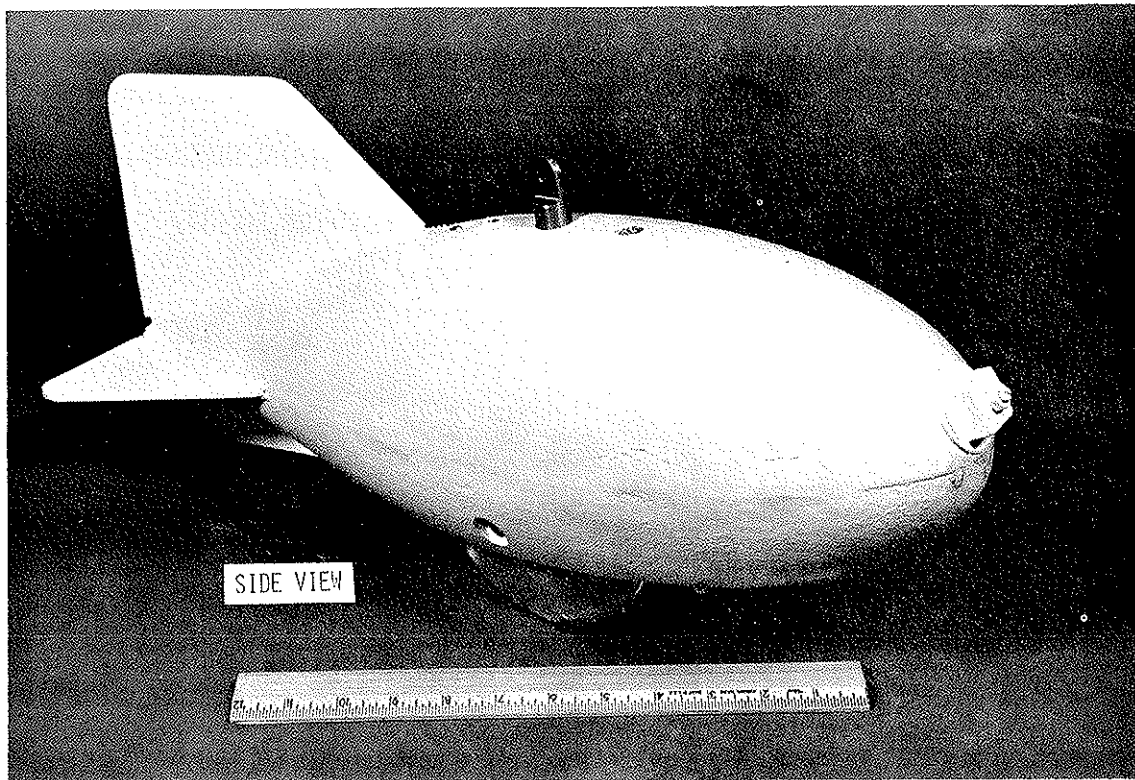


Figure 1. BED-MATERIAL SAMPLER, US BM-54

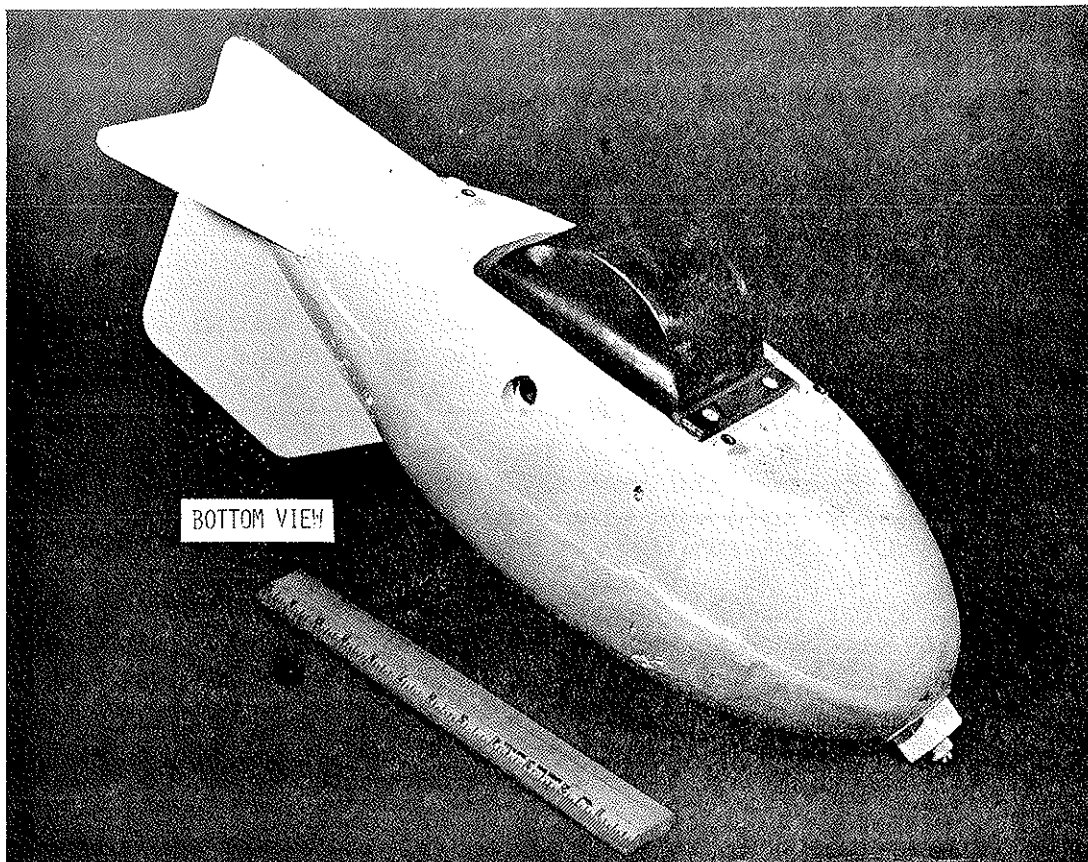


Figure 2. BED-MATERIAL SAMPLER BOTTOM VIEW, US BM-54

PHYSICAL CHARACTERISTICS

Overall length (less nozzle) = 22 in. (55.9 cm)
 Approximate width = 6 7/8" (17.5 cm)
 Weight = 100 lbs. (45.4 kg)
 Shipping weight = 127 lbs. (57.6 kg)

SHIPPING INFORMATION

Box dimensions = 28 x 11 x 13 in.
 (71.1 x 27.9 x 33 cm)
 Box volume = 2.3 ft³ (0.71 m³)

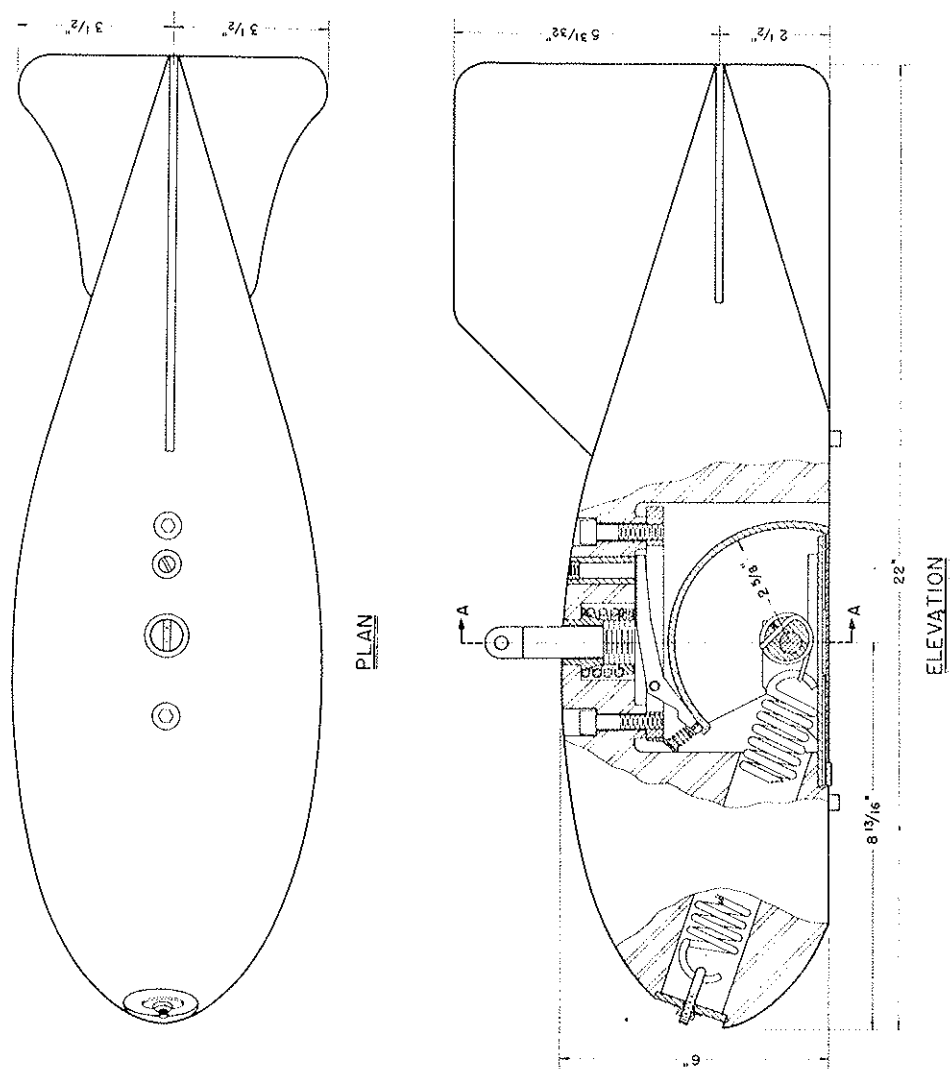
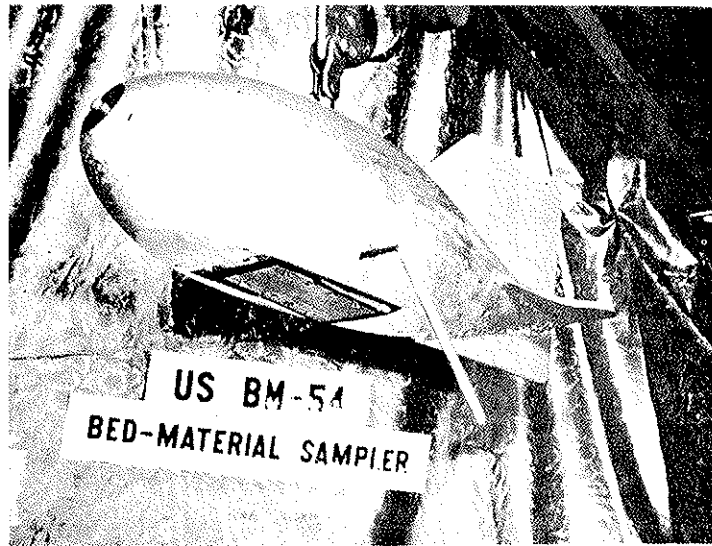
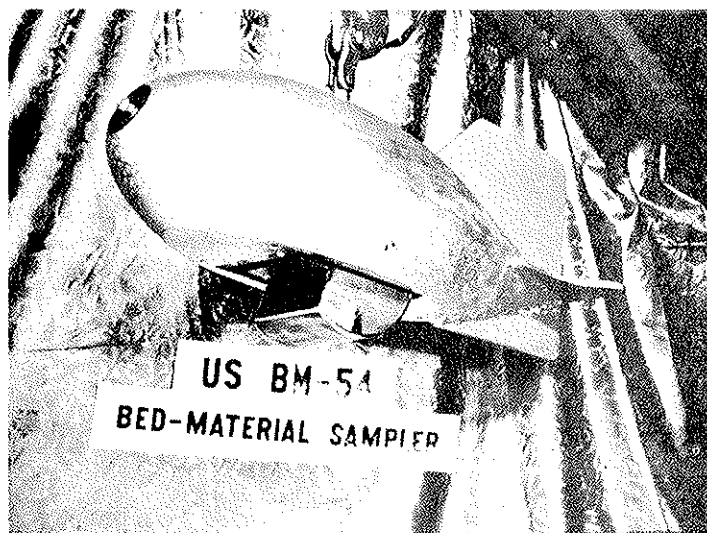


Figure 3. BED-MATERIAL SAMPLER, US BM-54



Bucket retracted



Bucket exposed

FIG. 4 --BED-MATERIAL SAMPLER, US BM-54

Hand-held, rotary-scoop bed material sampler, US RBMH-80

This hand-operated sampler has a semi-cylindrical bucket for collecting the sample. Operation is simple: the lever on the handle opens and closes the bucket. The sampled material is protected from erosion while rising through the water column.

—PHYSICAL CHARACTERISTICS—

Overall length = 56" (142.3 cm)
Approximate width = 8" (20.3 cm)
Height = 4" (10.2 cm)
Weight = 8 lbs. (3.6 kg)
Shipping weight = 18 lbs. (8.2 kg)

Bucket volume = 3 1/4 width x 2 3/4 dia.
 (8 cm x 7 cm)
Depth of sample = 1 3/4" (4.5 cm)

—SHIPPING INFORMATION—

Box dimensions = 10 x 10 x 62 in.
 (25.4 x 25.4 x 157.5 cm)
Box volume = 3.59 ft³ (0.1 m³)

Note: Physical shape and design may vary from one production to another.

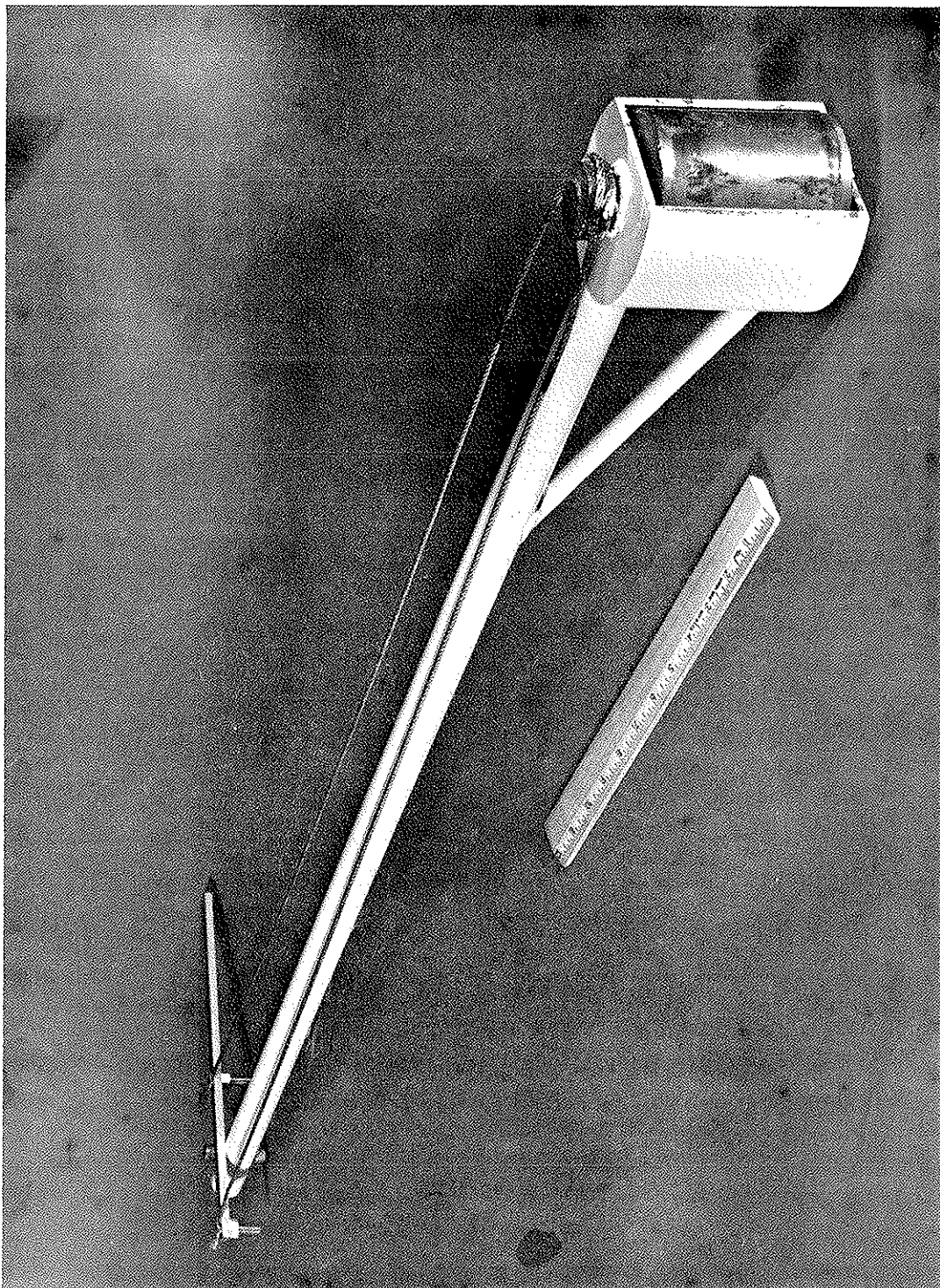


Figure 1. HAND-HELD, ROTARY-SCOOP BED MATERIAL SAMPLER,
US RBMH-80

Visual-accumulation-tube size analyzer, US VATSA-58

This is a laboratory instrument for the simple and rapid determination of the size-frequency distribution of sand samples containing particles from 62 microns to 2 millimeters. The instrument records results in terms of the fall diameter of the individual particles of the sample.

The analyzer consists of a glass sedimentation tube, a valve mechanism and a recorder (see figure 1). The lower end of the glass sedimentation tube is reduced in diameter to facilitate measurement of accumulated sediment. Tubes 120-cm long are furnished in 4 sizes with the lower end reduced to 2.1, 3.4, 5.0 and 7.0-mm inside diameter, respectively. These tubes are for analyzing sands up to 2 mm in size. Selection of the tube to be used is based on the quantity and size of material available in the sample to be analyzed. The 180-cm tube and accessories are not furnished as part of the analyzer because the tube is difficult to pack so that it will not be broken in shipment. It is more satisfactory to have this tube made locally. The accessories for the 180-cm tube may be obtained on special order.

To make an analysis, the sample is introduced into the top of the tube. The particles are separated in size as they fall through the water in the tube. As the sediment accumulates in the settling section of the tube, the height of the column is followed manually and a grain-size curve is automatically and simultaneously traced on a chart. The percent finer of each particle-size classification in the sample analyzed may be read from this graph. A sample of the size-distribution graph showing the method of reading size distribution in percent is shown in figure 3.

A supply of 200 charts are furnished with the analyzer.

Additional information on the visual-accumulation-tube sand-size analyzer is given in Report No. 11 and Report K. Report K is furnished with each analyzer.

An automatic tracking device that can be attached to the VA tube is also available. The device is equipped with a light source and photocell which is coupled to a motor attached to the hand crank. As the sand accumulates at the bottom of the glass tube the motor automatically drives the photocell upward to keep it aligned with the top of the sand column. The device eliminates manual tracking particularly during the last three minutes of analysis when the rate of accumulation is slow. Price is available on request.

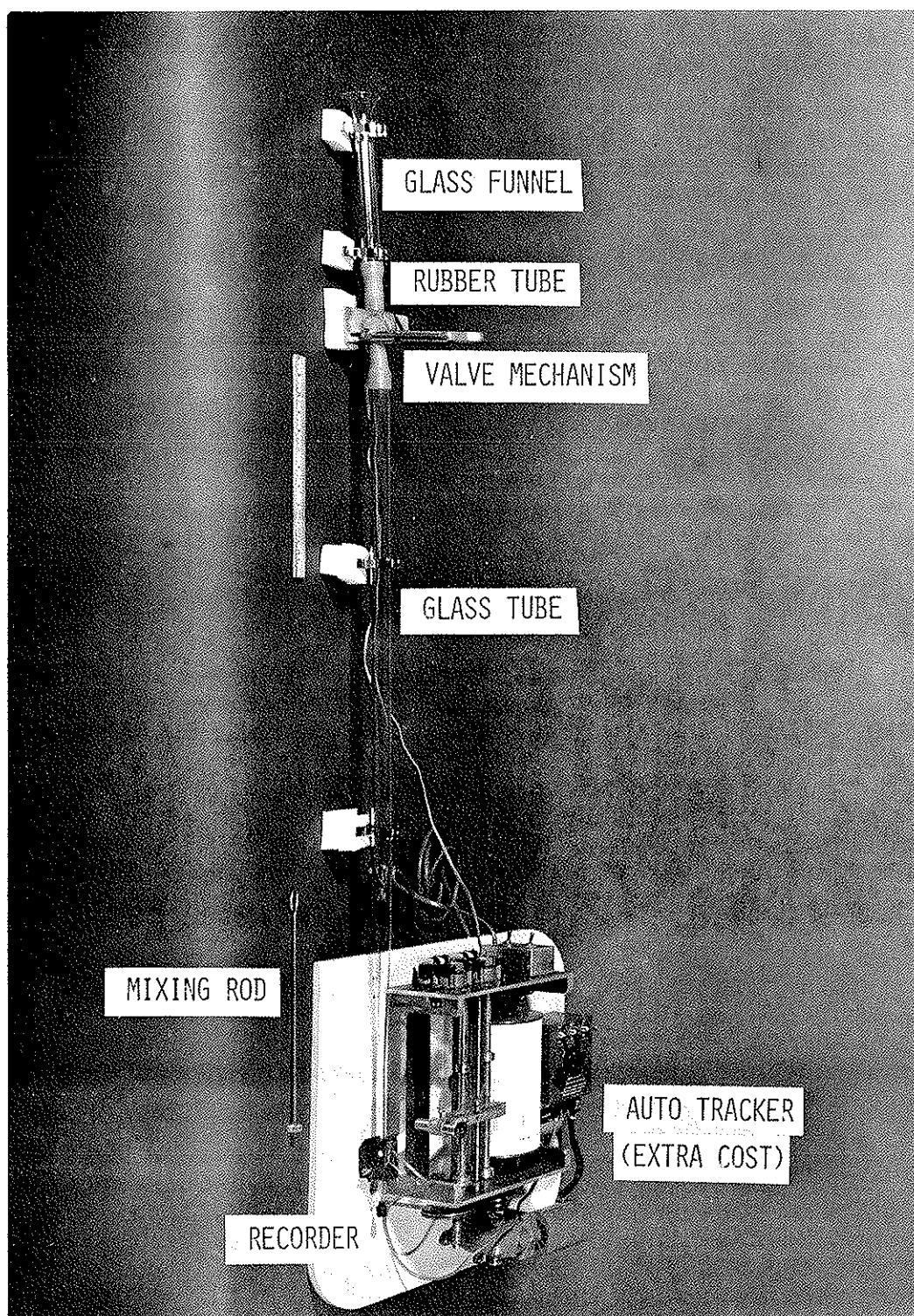


Figure 1. VISUAL-ACCUMULATION-TUBE SIZE ANALYZER,
US VATSA-58 ; WITH AUTO TRACKER

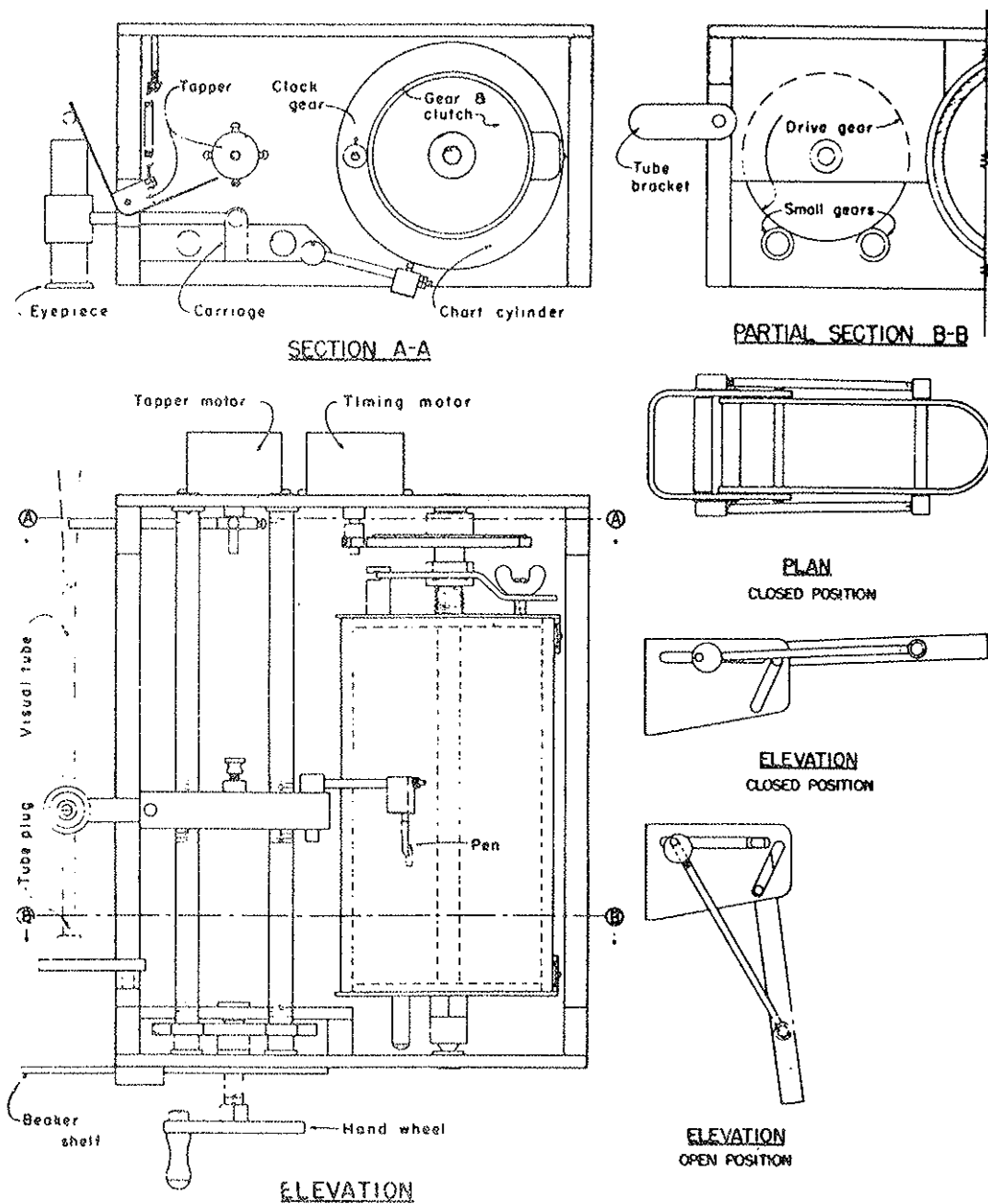


Figure 2. VISUAL-ACCUMULATION-TUBE SAND SIZE ANALYZER,
RECORDER AND VALVE MECHANISM

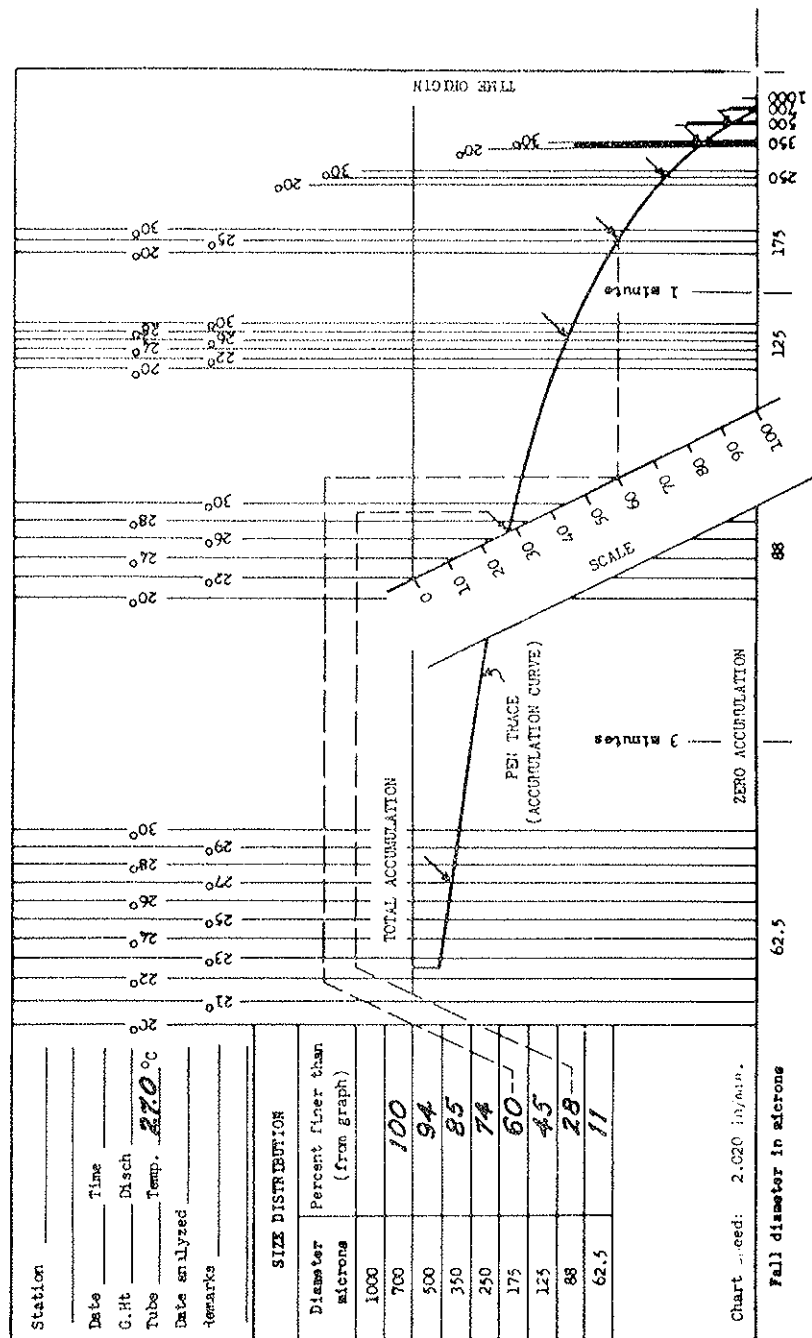


Figure 3. VISUAL-ACCUMULATION-TUBE SAND SIZE ANALYZER
RECORDER CHART FOR 120 CM TUBE SHOWING
METHOD OF READING SIZE DISTRIBUTION

—PHYSICAL CHARACTERISTICS—

Overall length = 11" (27.9 cm)
Approximate width = 15" (38.1 cm)
Height = 6" (15.2 cm)
Weight = 52 lbs. (23.64 kg)
Shipping weight: Box #1 (tubes) = 24 lbs. (10.9 kg)
Box #2 (VATSA) = 58 lbs. (26.3 kg)
(VATSA with auto tracker = 62 lbs.,
28.2 kg)

—SHIPPING INFORMATION—

Box dimensions: Box #1 (tubes) = 18 x 4 1/4 x 52 in.
(45.7 x 10.8 x 132 cm)
Box #2 (VATSA) = 24 x 20 x 9 in.
(61 x 50.8 x 22.9 cm)
Box volume: Box #1 (tubes) = 2.3 ft³ (0.7 m³)
Box #2 (VATSA) = 2.5 ft³ (0.76 m³)

Automatic Tracker Kit, US VATSA-AT

The automatic tracker is an attachment to the visual-accumulation-tube size analyzer, US VATSA-58. This unit can be bought initially with the VATSA or purchased later as an add-on unit.

The unit consists of a motor, a drive system, a control box, and a photoelectric sensor. The functions of the control box are: on, off; forward, reverse; and manual on the automatic.

The purpose of this device is to adjust the recorder down drive as a function of sediment density passing down through the tube. The sediment passes thru a focused light and a photoelectric cell. Sensitivity of the device is adjusted by a neostat on the control box. A small microscope eyepiece is used when auto-tracker is not purchased.

—PHYSICAL CHARACTERISTICS—

Length = 21" (53.3 cm)
Width = 20" (50.8 cm)
Height = 6 3/4" (17.2 cm)
Shipping weight = 60 lbs. (27.2 kg)
Weight = 45 lbs. (20.4 kg)

—SHIPPING INFORMATION—

Box dimensions = 24 x 23 x 9 in.
(61 x 58.4 x 22.9 cm)
Box volume = 2.9 ft³ (0.08 m³)

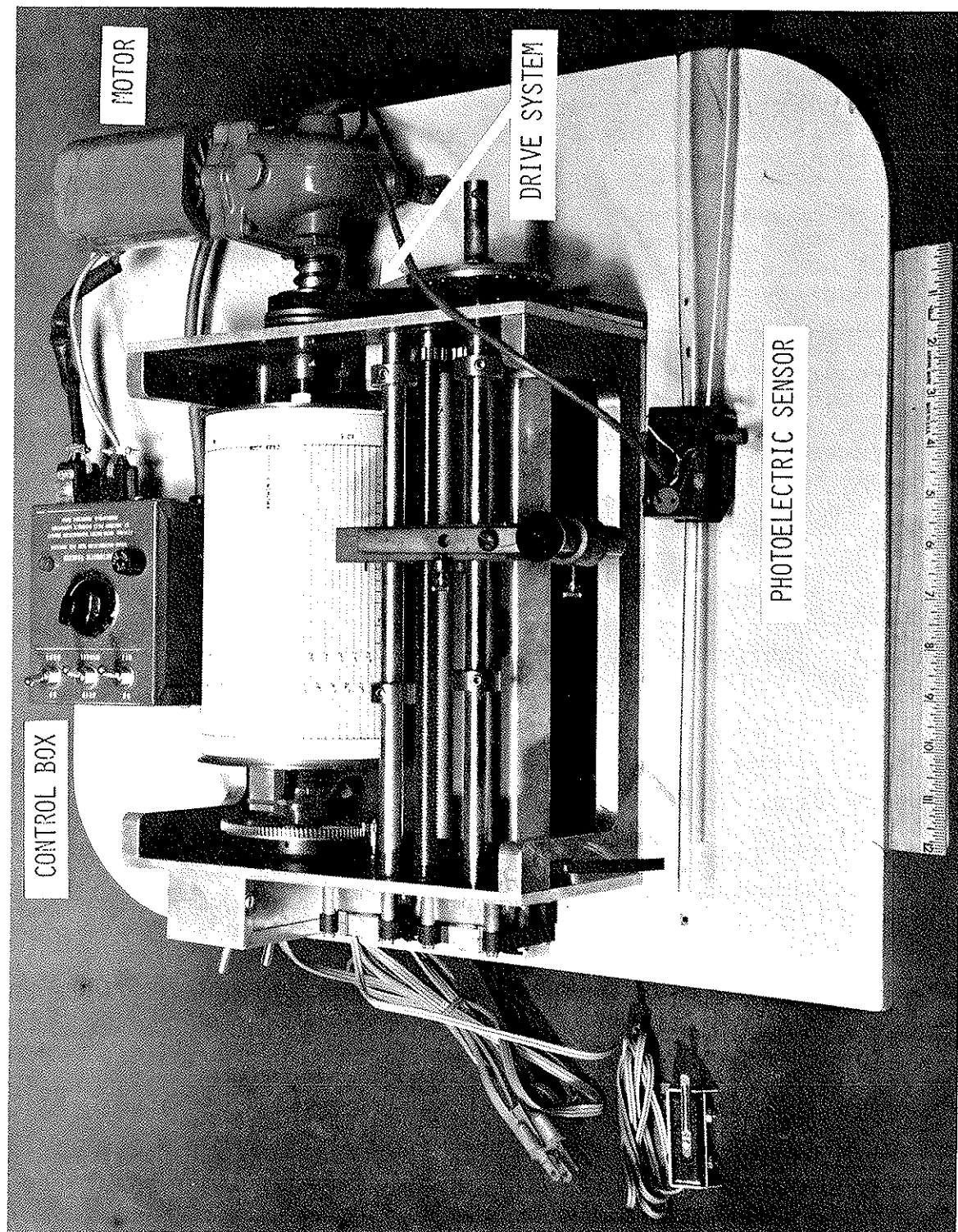


Figure 1. VISUAL-ACCUMULATION-TUBE SIZE ANALYZER WITH AUTOMATIC TRACKER UNIT

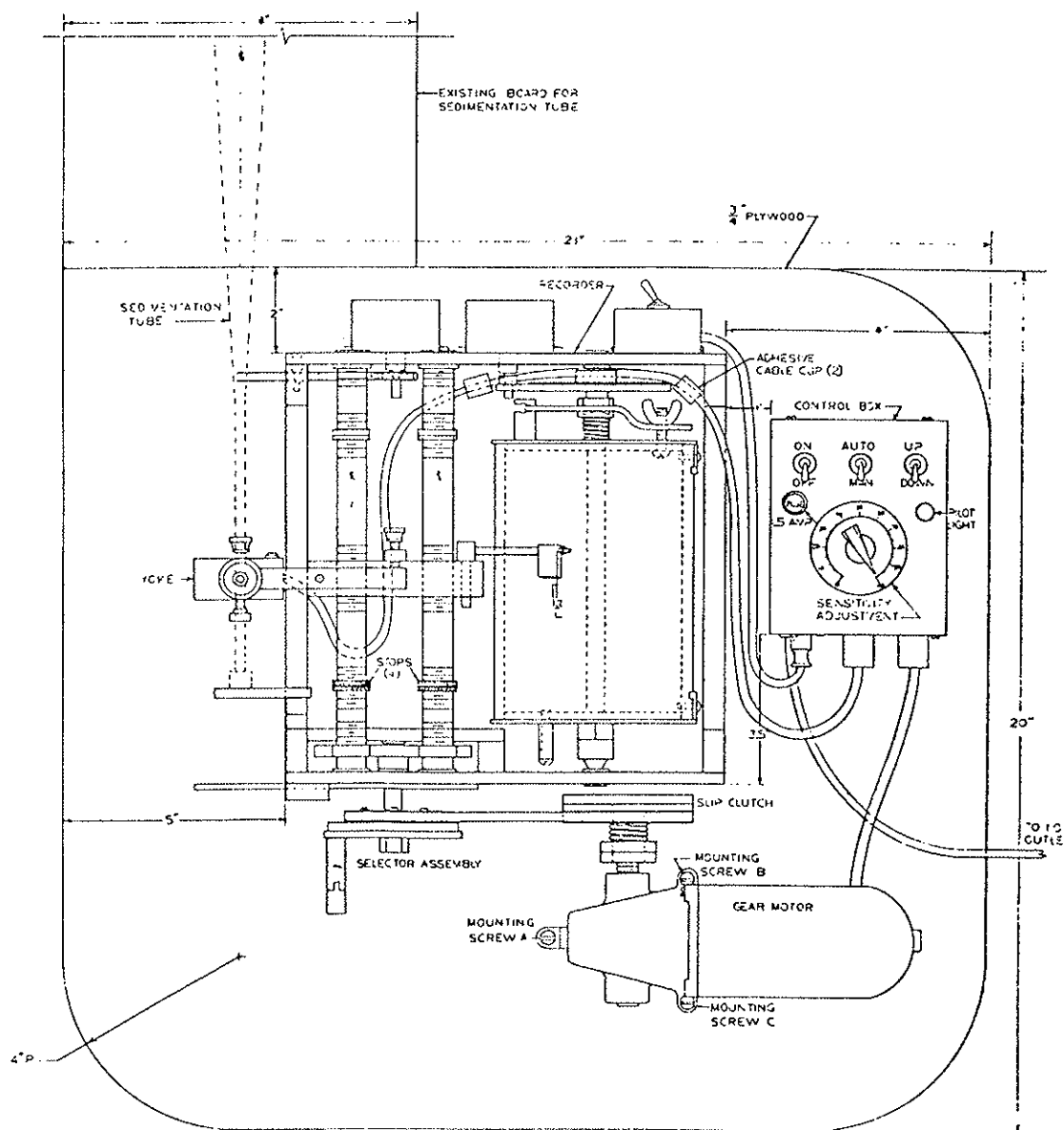


Figure 2. AUTOMATIC TRACKING ATTACHMENT
SUGGESTED MOUNTING ARRANGEMENT

Shaw Pipet Rack

This device grips a volumetric pipet (not furnished) and allows it to be raised and lowered vertically. A marked rod in the center lets the operator adjust the pipet depth a measured amount. The assembly is supported by a standard rod clamp from a laboratory stand (not furnished).

—PHYSICAL CHARACTERISTICS—

Length = 13" (33 cm)
Width = 12" (30.5 cm)
Depth = 1 3/4" (4.5 cm)
Weight = 3 1/2 lbs. (1.6 kg)
Shipping weight = 7 1/2 lbs. (3.4 kg)

—SHIPPING INFORMATION—

Box dimensions = 17 x 13 1/2 x 12 in.
(43.2 x 34.3 x 30.5 cm)
Box volume = 1.6 ft³ (0.49 m³)

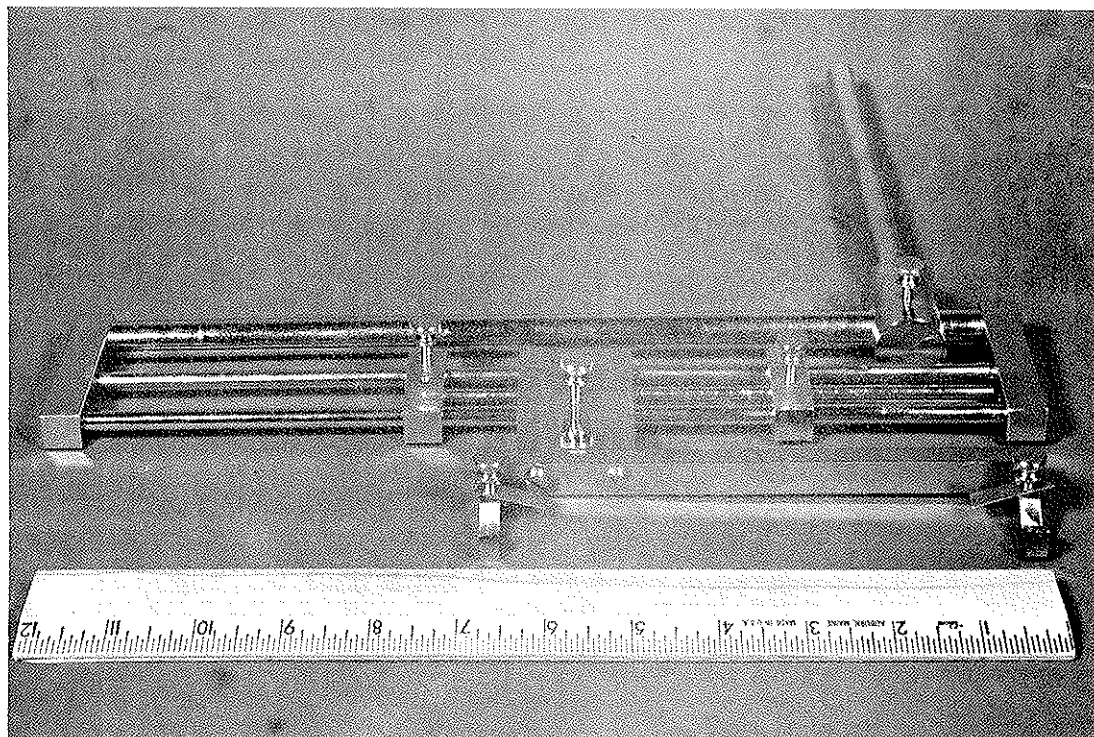


Figure 1. SHAW PIPET RACK

Vertical Transit Rate Pacer, US VTP-73

The US VTP-73 is a small, battery-powered metronome, or oscillator, which periodically sounds a tone in an earphone. Volume is continuously adjustable over a wide range. The tone provides a time-interval reference for pacing the lowering and raising of suspended-sediment samplers when collecting depth-integrated samples. The uniformity of vertical travel of a sampler is a factor in determining the accuracy of depth-integrated samples. The Pacer makes a more uniform vertical rate possible and therefore ensures a more accurate discharge-weighted sample. Any operator may reproduce a given vertical rate at any time and at any location. Reproducibility is particularly important when collecting samples from equally spaced verticals in the cross section. The audible signal eliminates the use of a stopwatch and frees the operator's hands and eyes for more important duties. The Pacer may be used in conjunction with hand-held samplers as well as mechanically hoisted samplers. The small size permits carrying the device in a shirt pocket. At minimum volume the tone is audible for a distance of several feet so that, in a quiet environment, the earphone need not be worn.

The operator selects the appropriate vertical transit rate, based on mean stream velocity, then selects the proper switch position from a table. There are three tables, one for each of the common reel circumferences. The table lists vertical transit rates for the sampler for each switch position for each of three methods: double counting, which is two counts per revolution of the suspension reel; single counting, or one count per revolution; and half counting, or one count per two revolutions. Hand-held samplers, such as the US DH-48, can use the one-foot-reel table referenced to the one-foot marks on the suspension rod.

The Pacer is about 1 1/4 x 2 1/2 x 4 3/4 inches and weighs about half a pound with the supplied batteries. The tables are provided on a single gummed decal. Two of the three tables may be cut to size and fastened to the box. A plug for the earphone and an adapter plug for standard 1/4-inch diameter plugs are supplied with the Pacer, but not the earphone itself. Most stream gaging earphones are suitable. A photograph of the US VTP-73 is shown in figure 1.

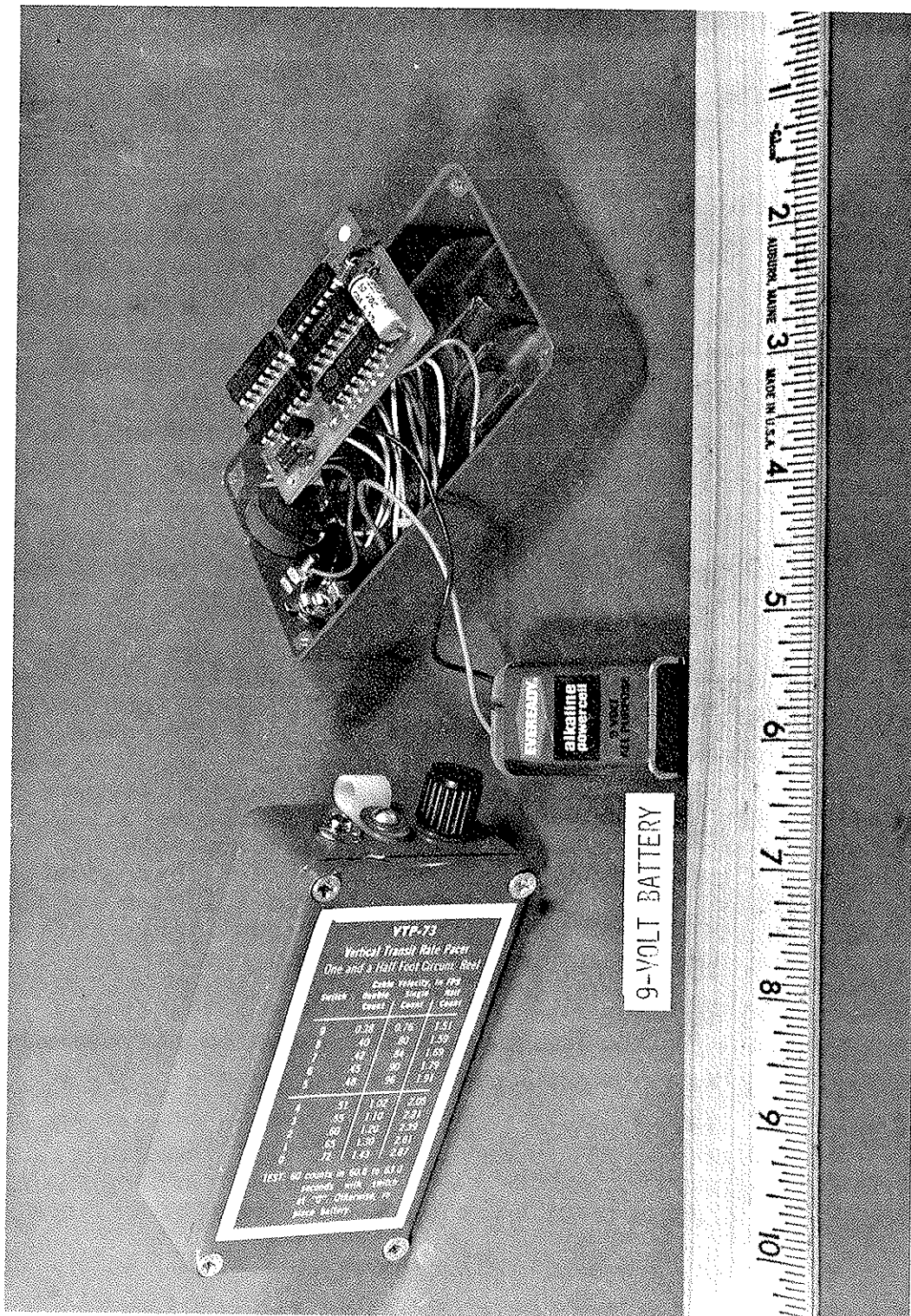


Figure 1. VERTICAL TRANSIT RATE PACER, US VTP-73

—PHYSICAL CHARACTERISTICS—

Weight = 1/2 lb. (0.23 kg)
Shipping weight = 1 1/2 lbs. (0.68 kg)
Height = 4 1/4" (10.8 cm)
Width = 2 1/2" (6.4 cm)
Depth = 1 1/4" (3.2 cm)

—SHIPPING INFORMATION—

Box dimensions = 6 1/4 x 5 1/2 x 7 1/2 in.
(15.9 x 14 x 19 cm)
Box volume = 0.15 ft³ (.05 m³)

Laboratory sample splitter, US LSS-72A and B

The laboratory sample splitter is a device for subdividing a sediment sample prior to laboratory analysis. When a sample is poured into the funnel it flows into a series of thin rectangular chutes. Each chute leads to one of two containers placed below the splitter body. Chutes are staggered to approximate a random split of both particles and liquid and thereby insure the two sample halves are nearly identical.

The splitter body is made from TFE fluorocarbon plastic sheets; the funnel is pressed acrylic plastic; and the stand is made of type 316 stainless steel. Because only the plastic materials contact the sample, the device is suitable for use in analysis for minute traces of metals. The funnel may be removed to facilitate cleaning. The inside of the chutes may be scrubbed but only with a brush no wider than 3/32-inch.

The A model will accommodate one-liter fluorocarbon beakers with a maximum height of 6 1/4-inches. The B model will accommodate a tray of 2 1/4-inches maximum height and 9 3/8-inch maximum width. Both models use the same funnel and the same splitter body which contains approximately 18 chutes (each 3/32-inch wide). Photographs are shown in figures 1 and 2. Neither the trays nor the beakers are provided; only the splitter, funnel, and stand are stocked.

—PHYSICAL CHARACTERISTICS—

Height = 10 1/2" (26.7 cm)
Width = 9 1/2" (24.1 cm)
Depth = 8" (20.3 cm)
Approximate weight = 4 lbs. (1.8 kg)
Shipping weight = 8 lbs. (3.6 kg)

—SHIPPING INFORMATION—

Box dimensions = 15 x 12 x 10 1/2 in.
(38.1 x 30.5 x 26.7 cm)
Box volume = 1.09 ft³ (0.33 m³)

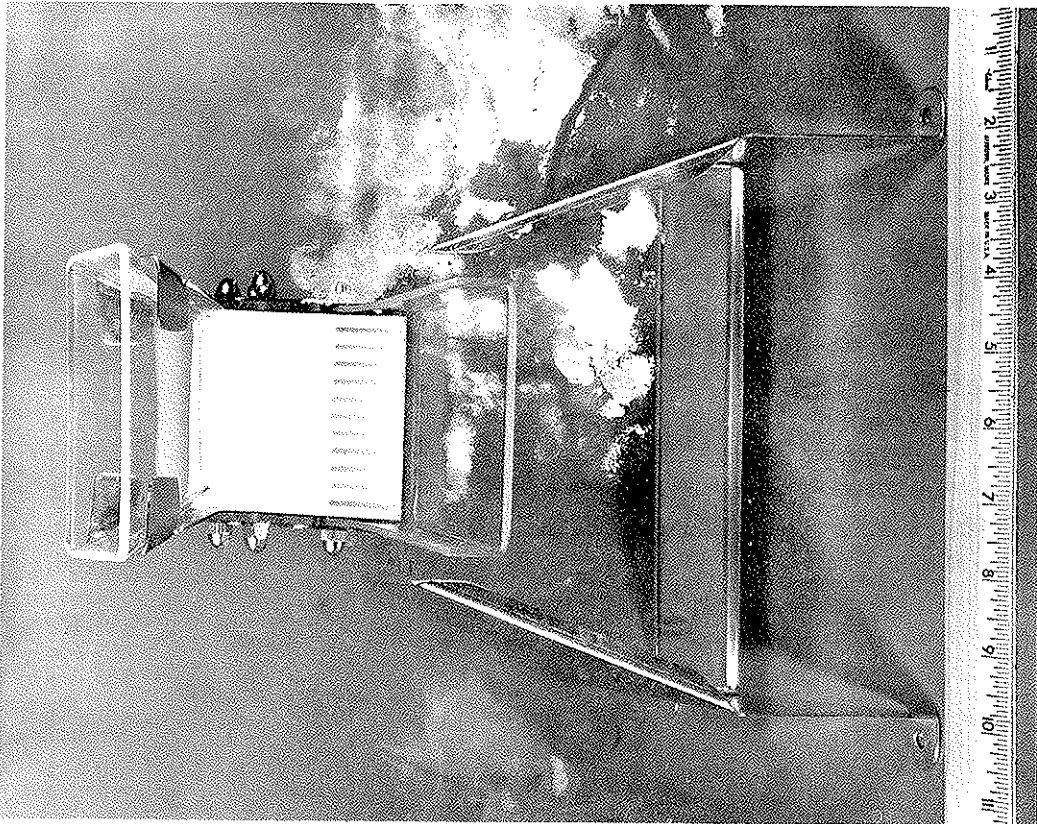


Figure 1. SAMPLE SPLITTER, US LSS-72, FRONT VIEW

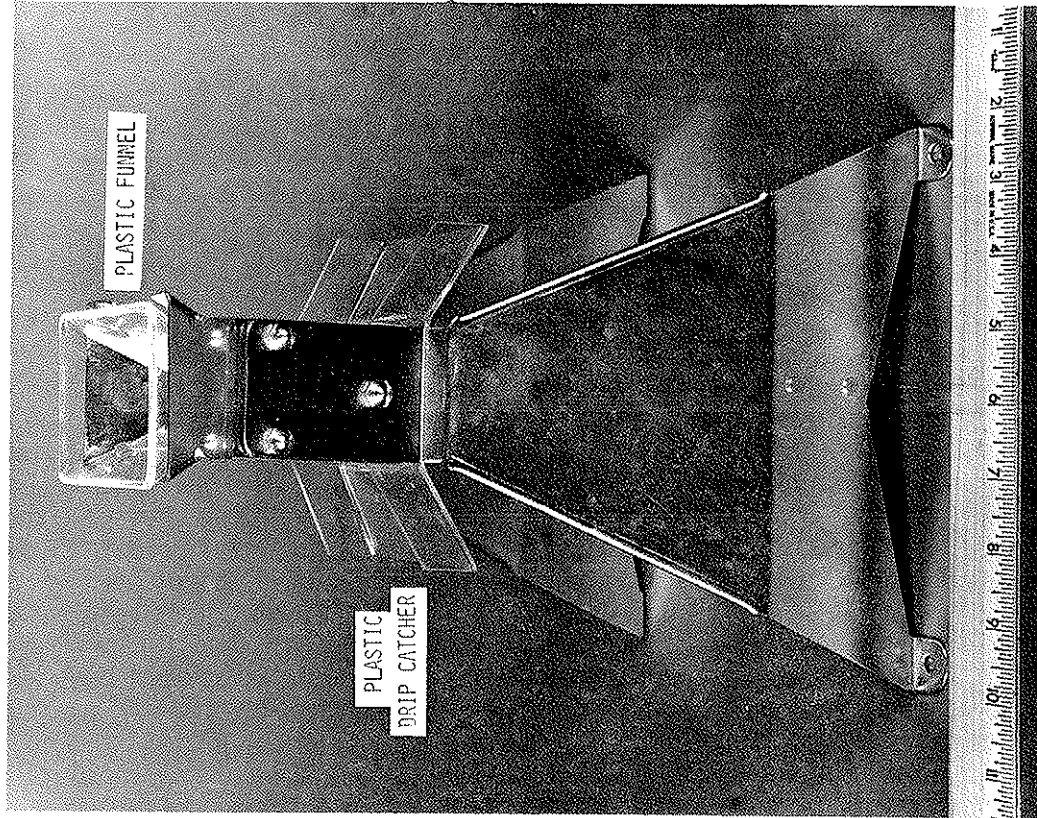


Figure 2. SAMPLE SPLITTER, US LSS-72, SIDE VIEW

Plastic sieve ring, US SR-72A, B and C

The US SR-72A is a 5 1/2-inch diameter sieve ring made of PVC plastic. These rings are for use in processing samples that may be chemically altered if they are used with metal sieves. As shown in figure 1; plastic sieve cloth made of nylon, teflon, or polyethylene may be stretched over rings and then fixed by means of nylon self-locking straps. If worn or damaged, the cloth may be replaced. The US SR-72A consists of one ring, five straps, and instructions for installing the cloth. Sieve cloth is not included, but vendors and ordering information will be supplied on request.

The US SR-72B and C are the top and bottom caps, respectively, necessary for use with a laboratory shaker (see photograph, figure 1). Eight-inch diameter flanges will mate with most shakers, although special diameters can be supplied. Figure 2 shows a nested stack ready for insertion in a laboratory shaker.

PHYSICAL CHARACTERISTICS

Single sieve:	Height = 2 1/4" (5.7 cm)
	Width = 6 1/2" dia. (16.5 cm)
	Weight = 1 lb. (0.45 kg)
Nested sieves:	Height = 6" (15.2 cm)
	Width = 8" dia. (20.3 cm)
	Weight = 4 lbs. (1.8 kg)
	Shipping weight = 8 lbs. (3.6 kg)

SHIPPING INFORMATION

Box dimensions =	17 x 13 1/2 x 12 in.
	(43.2 x 34.3 x 30.5 cm)
Box volume =	1.6 ft ³ (0.49 m ³)

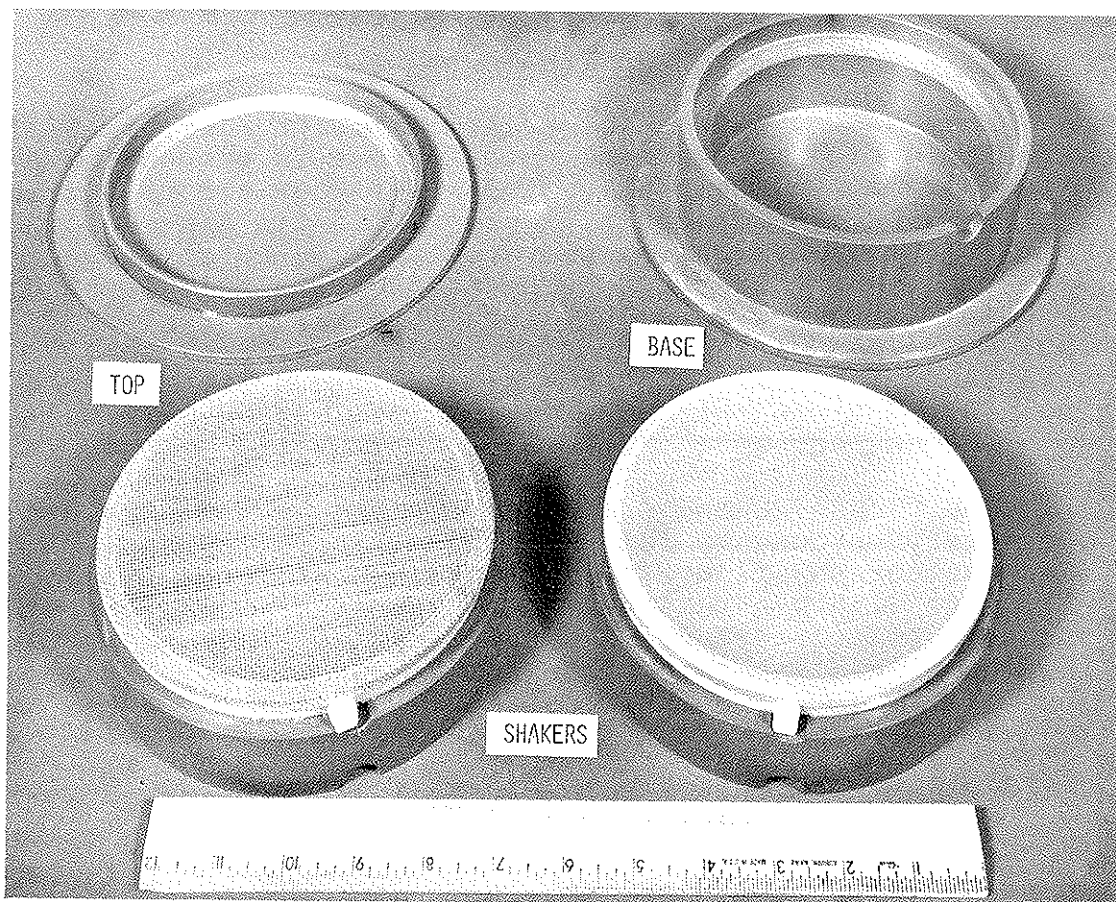


Figure 1. PLASTIC SIEVE RING, US SR-72A, B AND C

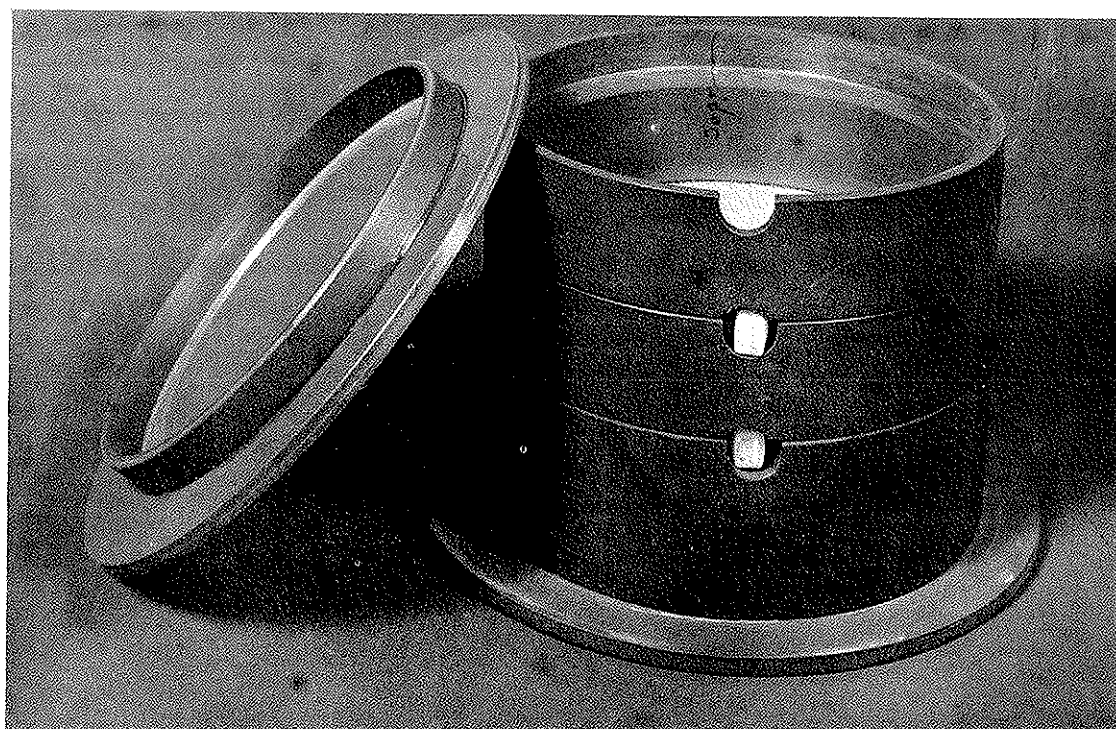


Figure 2. PLASTIC SIEVE RING, US SR-72A, B AND C, NESTED

Cumulative Water-Level Recorder, CWLR-84

The cumulative water-level recorder was designed to measure total runoff from test plots. A special ratcheting counter is connected to a float mounted in a basin such as a stock tank. When the water level rises the counter advances but when the water level falls the counter locks.

Primary features of the instrument are low cost and low maintenance. The recorder is totally mechanical and therefore requires no electrical power sources. Externally, the recorder consists of a 55-gallon barrel with a 10 inch x 6 inch x 5 inch box mounted on top. A window on top of the box allows for direct reading of the counter.

Details on the recorder's operation are given in the report entitled, "A Runoff and Soil-loss Monitoring Technique Using Paired Plots" cited under the Miscellaneous Reports Section of this catalog.

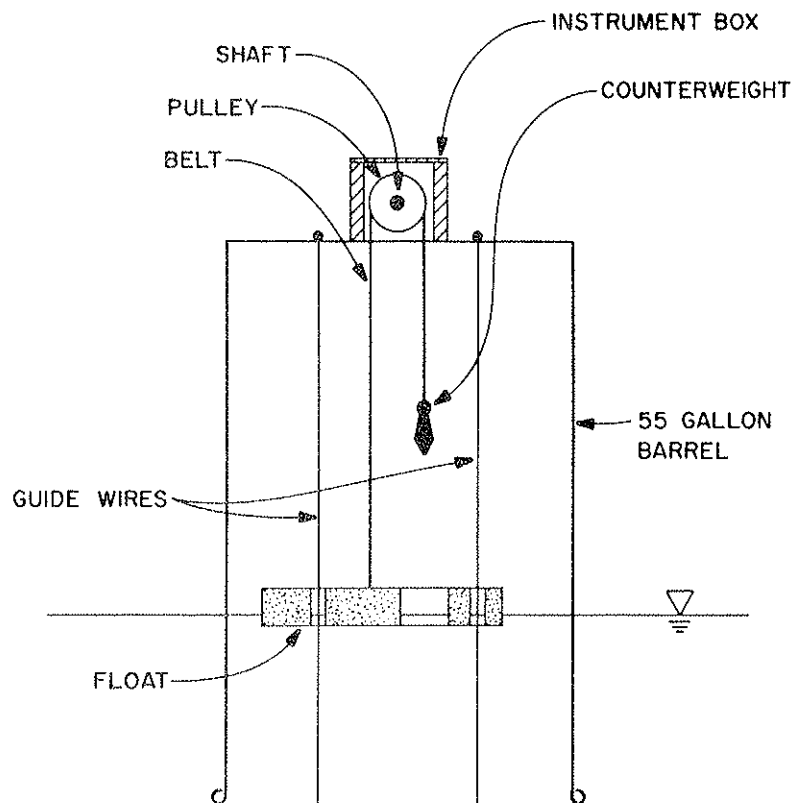


Figure 1 - CUMULATIVE WATER-LEVEL RECORDER,
CWLR-84 (CONNECTED TO FLOAT)

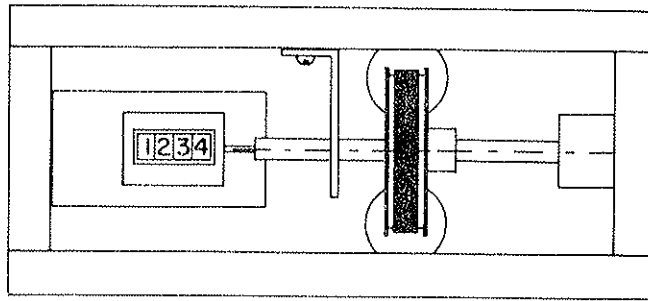


Figure 2 - TOP VIEW OF CUMULATIVE
WATER-LEVEL RECORDER, CWLR-84

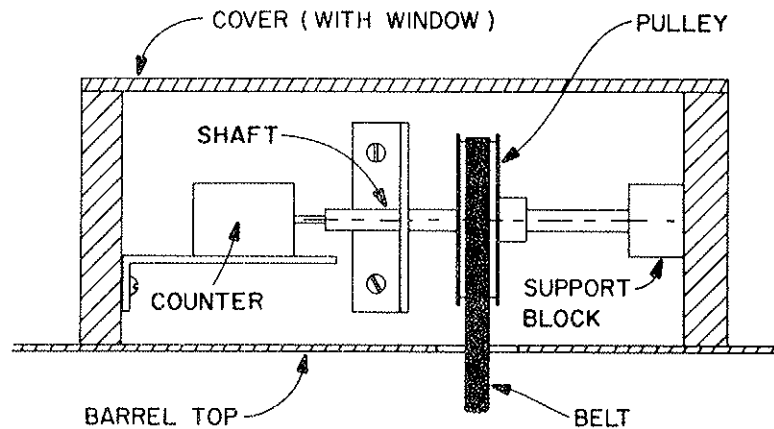


Figure 3 - FRONT VIEW OF CUMULATIVE
WATER-LEVEL RECORDER, CWLR-84

PHYSICAL CHARACTERISTICS

Overall height	=	37 1/2" (17 cm)
width	=	22 " (9.6 cm)
depth	=	22 " (9.6 cm)
Weight	=	56 pounds (25.4 kg)
Shipping weight	=	58 pounds (26.3 kg)

SHIPPING INFORMATION

Barrel Dimensions	=	22" diameter x 34" high
Barrel Volume	=	2.38 ft ³ (1990 cm ³)

Reports on the cooperative study of methods used in MEASUREMENT AND ANALYSIS OF SEDIMENT LOAD IN STREAMS covers phase indicated by the following titles. Information regarding prices on the reports listed below is available from the project.

Numbered Reports

- Report No. 1 FIELD PRACTICE AND EQUIPMENT USED IN SAMPLING SUSPENDED SEDIMENT 1940.

A detailed review of the equipment and methods used in suspended-sediment sampling from the time of the earliest known investigations to 1940, with discussions of the advantage and disadvantages of the various methods and instruments used. The requirements of a sampler that would satisfy all field conditions are set forth.

- Report No. 2 EQUIPMENT USED FOR SAMPLING BED LOAD AND BED MATERIAL 1940.

A review of the equipment and methods used in bed-load and bed-material sampling in a manner similar to that in which Report No. 1 covers the sampling of suspended sediment.

Similar information is found in Geological Survey Water-Supply Paper 1748, "Apparatus and Techniques for Measuring Bedload" by D. W. Hubbell, available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402.

- Report No. 3 ANALYTICAL STUDY OF METHODS OF SAMPLING SUSPENDED SEDIMENT 1941.

Covers an investigation of the accuracy of various methods of sampling suspended sediment in a vertical section of a stream. This analytical study is based on the application of turbulence theories to sediment transportation.

- Report No. 4 METHODS OF ANALYZING SEDIMENT SAMPLES 1941.

Describes many methods for determining the size of small particles and for establishing the particle-size gradation and the total concentration of sediment in samples. Detailed

instructions are given for many of the common methods that have been developed and used by agencies doing extensive work in sedimentation.

- Report No. 5 LABORATORY INVESTIGATIONS OF SUSPENDED-SEDIMENT SAMPLERS 1941.

Reports the effects of intake conditions on the representativeness of sediment samples and on the filling characteristics of slow-filling samplers.

- Report No. 6 THE DESIGN OF IMPROVED TYPES OF SUSPENDED-SEDIMENT SAMPLERS 1952.

Describes the development of various integrating samplers suitable for taking vertically depth-integrated samples in flowing streams and others suitable for taking time-integrated samples at a fixed point. Details of the recommended types are given.

- Report No. 7 A STUDY OF NEW METHODS FOR SIZE ANALYSIS OF SUSPENDED-SEDIMENT SAMPLES 1943.

Reports on research to develop methods of size analysis suitable for most suspended-sediment investigations and describes a new apparatus and technique, the bottom-withdrawal-tube method.

- Report No. 8 MEASUREMENT OF THE SEDIMENT DISCHARGE OF STREAMS 1948.

Describes methods and equipment for use in making sediment measurements under the diverse conditions that are encountered in streams.

Superseded by Report No. 14.

- Report No. 9 DENSITY OF SEDIMENTS DEPOSITED IN RESERVOIRS 1943.

Presents data on the apparent density of sediment deposited in various reservoirs. The results are summarized, and certain conclusions useful in engineering studies are given.

Report No. 10 ACCURACY OF SEDIMENT SIZE ANALYSIS MADE BY
THE BOTTOM-WITHDRAWAL-TUBE METHOD 1953.

Recounts extensive tests made to evaluate the accuracy of the bottom-withdrawal-tube method. Glass spheres of sand sizes were used as the sediments.

Report No. 11 THE DEVELOPMENT AND CALIBRATION OF THE
VISUAL-ACCUMULATION TUBE 1957.

Describes the design of equipment and methodology useful for a simple and accurate analysis of size gradation of sediments of sand sizes.

Report No. 12 SOME FUNDAMENTALS OF PARTICLE-SIZE ANALYSIS
1957. From Government Printing Office,
Washington, D.C.

Presents some of the basic concepts, definitions, and data on relationships in the field of particle size analysis. The relation of fall velocity to physical size is examined in detail.

Report No. 13 THE SINGLE-STAGE SAMPLER FOR SUSPENDED
SEDIMENT 1961. From Government Printing
Office, Washington, D.C.

Describes four types of sampler and discusses methods for obtaining samples automatically when the water surface first rises to a selected stage.

Report No. 14 DETERMINATION OF FLUVIAL SEDIMENT DISCHARGE
1963.

This report reviews the equipment, practices, and some of the basic concepts of fluvial sediment investigations. Fundamental concepts of sediment transport are described. General principles of sediment discharge measurements are discussed as well as the practical aspects of selecting sampling points and of determining frequency of sampling. Depth-integrating, point-integrating, single-stage, and pumping type suspended-sediment samples and bed-material samplers are discussed.

CATALOG

INSTRUMENTS AND REPORTS FOR FLUVIAL SEDIMENT
INVESTIGATIONS, FEDERAL INTER-AGENCY SEDIMENT-
TATION PROJECT

Lettered Reports

- Report A PRELIMINARY FIELD TESTS OF THE U.S. SEDIMENT-SAMPLING EQUIPMENT IN THE COLORADO RIVER BASIN
APRIL 1944
- Report B FIELD CONFERENCES ON SUSPENDED-SEDIMENT SAMPLING
SEPTEMBER 1944
- Report C COMPARATIVE FIELD TESTS ON SUSPENDED-SEDIMENT SAMPLERS PROGRESS REPORT
DECEMBER 1944
- Report D COMPARATIVE FIELD TESTS ON SUSPENDED-SEDIMENT SAMPLERS PROGRESS REPORT
JANUARY 1946
- Report E MEASUREMENT AND ANALYSIS OF SEDIMENT LOADS IN STREAMS
JULY 1946

(See Trans. ASCE Vol. 116, P. 891, 1951 Paper No. 2450)
- Report F FIELD TESTS ON SUSPENDED-SEDIMENT SAMPLERS, COLORADO RIVER AT BRIGHT ANGEL CREEK NEAR GRAND CANYON, ARIZONA
AUGUST 1951
- Report G PRELIMINARY REPORT ON US DH-48 (HAND) SUSPENDED-SEDIMENT SAMPLER
(Superseded by material in Report No. 6)
- Report H INVESTIGATION OF INTAKE CHARACTERISTICS OF DEPTH-INTEGRATING SUSPENDED-SEDIMENT SAMPLERS AT THE DAVID TAYLOR MODEL BASIN
NOVEMBER 1954
- Report I OPERATION AND MAINTENANCE OF US P-46 SUSPENDED-SEDIMENT SAMPLER
MAY 1962
- Report J OPERATING INSTRUCTIONS FOR US DH-48 SUSPENDED-SEDIMENT HAND SAMPLER
MAY 1965
- Report K OPERATOR'S MANUAL, THE VISUAL-ACCUMULATION-TUBE METHOD FOR SEDIMENTATION ANALYSIS OF SANDS
OCTOBER 1958
- Report L VISUAL-ACCUMULATION TUBE FOR SIZE ANALYSIS OF SANDS, Jour. Hydr. Div., ASCE, Vol. 82, No. HY3, Paper No. 1004
JUNE 1956
- Report M OPERATION AND MAINTENANCE OF US BM-54 BED-MATERIAL SAMPLER
OCTOBER 1964

Report N INTERMITTENT PUMPING-TYPE SAMPLER
PROGRESS REPORT FEBRUARY 1960

Report O INSTRUCTIONS FOR SAMPLING WITH DEPTH-INTEGRATING
SEDIMENT SAMPLERS US D-49 AND DH-59 APRIL 1965

Report P INVESTIGATIONS OF DIFFERENTIAL-PRESSURE GAGES FOR
MEASURING SUSPENDED-SEDIMENT CONCENTRATIONS
JUNE 1961

Report Q INVESTIGATION OF A PUMPING SAMPLER WITH ALTERNATE
SUSPENDED-SEDIMENT HANDLING SYSTEMS
PROGRESS REPORT June 1962

Report R ELECTRONIC SENSING OF SEDIMENT
PROGRESS REPORT DECEMBER 1964

Report S A SUMMARY OF THE WORK OF THE FEDERAL INTER-AGENCY
SEDIMENTATION PROJECT JANUARY 1963

INSTRUCTIONS FOR P-61-A1 SUSPENDED SEDIMENT
SAMPLER 1964

Report T LABORATORY INVESTIGATION OF PUMPING-SAMPLER
INTAKES PROGRESS REPORT APRIL 1966

Report U AN INVESTIGATION OF A DEVICE FOR MEASURING THE
BULK DENSITY OF WATER-SEDIMENT MIXTURES
AUGUST 1974

Report V LABORATORY TESTS OF THE ISOKINETIC SAMPLING
METHOD
(This investigation has not been completed)

Report W TEST AND DESIGN OF AUTOMATIC FLUVIAL SUSPENDED-
SEDIMENT SAMPLERS 1981

Report X A FLUID-DENSITY GAGE FOR MEASURING SUSPENDED-
SEDIMENT CONCENTRATION 1982

Report Y DEVELOPMENT OF A BAG-TYPE SUSPENDED-SEDIMENT
SAMPLER JULY 1982

Report Z THEORY AND OPERATION MANUAL FOR THE AUTOPIPET
SEMIAUTOMATIC PIPET WITHDRAWAL APPARATUS 1982

Report BB THEORY OF THE MANOMETRIC METHOD FOR PARTICLE-
SIZE DISTRIBUTION MEASUREMENTS
(This investigation has not been completed)

Report CC TEST OF AN INFRARED LIGHT-EMITTING
TURBIDIMETER 1984

Report DD PROGRESS REPORT: PERFORMANCE OF THE
VIBRATING U-TUBE FLUID-DENSITY GAGE FOR
MEASURING SUSPENDED-SEDIMENT CONCENTRATION 1984

Report EE MATHEMATICAL MODEL OF A VIBRATIONAL-TYPE
SEDIMENT-CONCENTRATION GAGE
(This investigation has not been completed)

Report FF MEASURING THE SURFACE AREA OF SEDIMENT
PARTICLES 1984

ADDITIONAL INSTRUCTION MANUALS

OPERATOR'S MANUAL - US PS-69 PUMPING SAMPLER

OPERATOR'S MANUAL FOR PFC-70 PROPORTIONAL FREQUENCY
CONTROLLER

OPERATOR'S MANUAL FOR BM-54 AND BMH-60 BED-
MATERIAL SAMPLERS

OPERATOR'S MANUAL FOR US P-61-A1 SUSPENDED SEDI-
MENT SAMPLER

OPERATOR'S MANUAL - D-74, D-74AL, D-74TM AND
D-74 AL-TM DEPTH INTEGRATED SUSPENDED SEDIMENT
SAMPLERS

OPERATOR'S MANUAL FOR US BP-76 BATTERY PACK

OPERATOR'S MANUAL FOR TC-76 TIME CLOCK

OPERATOR'S MANUAL FOR TC-77 TIME CLOCK

OPERATOR'S MANUAL FOR RP-77 PERISTALTIC PUMP
MARCH 1979

OPERATOR'S MANUAL - US D-77 SUSPENDED SEDIMENT
SAMPLER, FEBRUARY 1979

OPERATOR'S MANUAL - US PS-82 AUTOMATIC PUMPING
SAMPLER, SEPTEMBER 1985

MISCELLANEOUS REPORTS

A Runoff and Soil-Loss Monitoring Technique
Using Paired Plots by William L. Jackson,
Karla Knoop, Joseph J. Szalona, and Shirley
Hudson, USDI, Bureau of Land Management,
Denver, Colo., Technical Note 368, August 1985.

Continuous Measurement of Suspended-Sediment
Concentration by J. V. Skinner, J. P.
Beverage, and G. L. Goddard, Proceedings
of Fourth Federal Interagency Sedimentation
Conference, Las Vegas, Nev., 1986.

Measurement of Scour-Depth Near Bridge Piers
by J. V. Skinner, U.S. Geological Survey,
Water-Resources Investigations Report 85-4106.

Construction drawings and reports

Requests for construction drawings, numbered and lettered reports should be addressed to District Engineer, U.S. Army Engineer District, St. Paul, Corps of Engineers, 1135 U.S. Post Office Building, St. Paul, MN 55101.

Construction Drawings

The following construction drawings are available.

Depth-integrating suspended-sediment wading-type hand sampler, US DH-48, 1 sheet, No. Z6-6-9.

Depth-integrating suspended-sediment shell-type hand sampler, US DH-75 P, 1 sheet, No. Z6-6-142.

Depth-integrating suspended-sediment shell-type hand sampler, US DH-75 Q, 1 sheet, No. Z6-6-143.

Depth-integrating suspended-sediment hand-line sampler, US DH-59, 1 sheet, No. Z6-6-37. Shipping crate for sampler, 1 sheet, No. Z6-6-125.

Depth-integrating suspended-sediment reel sampler, bronze, US D-74, 2 sheets, No. Z6-6-117 and 118. Shipping crate for sampler, 1 sheet, No. Z6-6-129.

Depth-integrating suspended-sediment reel sampler, aluminum version, US D-74 AL, 1 sheet, No. Z6-6-121. Shipping crate for sampler, 1 sheet, No. Z6-6-129.

Depth-integrating suspended-sediment hand-line sampler, US DH-76, 1 sheet, No. Z6-6-130. Shipping crate for sampler, 1 sheet, No. Z6-6-125.

Depth-integrating suspended-sediment reel sampler, US D-77, 3 sheets, No. Z6-6-200 to 202 inclusive. Shipping crate for sampler, 1 sheet, No. Z6-6-205.

Wading Rods to be used with above samplers, 1 sheet, No. Z6-6-206.

Point-integrating suspended-sediment sampler, US P-61-A1 5 sheets, No. Z6-6-58 to 62 inclusive. Shipping crate for sampler, 1 sheet, No. Z6-6-128.

Point-integrating suspended-sediment sampler, US P-63, 5 sheets, No. Z6-6-45 to 49 inclusive. Shipping crate for sampler, 1 sheet, No. Z6-6-127.

Point-integrating suspended-sediment hand-line or reel sampler, US P-72, 5 sheets, No. Z6-6-32 to 36 inclusive. Shipping crate for sampler, 1 sheet, No. Z6-6-128.

Wire Baskets, 2 sheets, No. Z6-6-179 and 180.

Automatic suspended-sediment single-stage sampler, US U-73, 5 sheets, No. Z6-6-109 to 113 inclusive.

Powered pumping sampler, US PS-69, 9 sheets, No. Z6-6-72 to 81 inclusive.

Powered pumping sampler, trace metal version, US PS-69 TM, 6 sheets, No. Z6-6-181 to 186 inclusive.

Chickaska powered pumping sampler, US CS-77, 10 sheets, No. Z6-6-131 to 140 inclusive.

Battery pack (accessory for point-integrating samplers), US BP-76, 1 sheet, No. Z6-6-141.

Control box (accessory for PS-69), US CB-69, 1 sheet, No. Z6-6-78.

Double sample trigger (accessory for PS-69), US DST-76, 1 sheet, No. Z6-6-149.

Fischer Porter event marker, US FP-73 EM, 1 sheet, No. Z6-6-100.

Leupold Stevens event marker, US LS-35 EM, 1 sheet, No. Z6-6-99.

Leupold Stevens digital event marker, US LSD-76 EM, 1 sheet, No. Z6-6-122.

Extension cable (for use with PS-69), US EC-76, 1 sheet, No. Z6-6-96.

Memory latch (for use with PS-69), US ML-77, 1 sheet, No. Z6-6-161.

Plastic quart tray-holders (for use with PS-69), US PTH-69, 1 sheet, No. Z6-6-160.

Proportional Frequency Controller, US PFC-70, 3 sheets, No. Z6-6-82 to 84 inclusive.

Shipping container, US SC-73, 2 different sheets, No. Z6-6-105 and Z6-6-97.

Electronic time clock (for use with PS-69), US TC-76,
1 sheet, No. Z6-6-152.

Electronic time clock (for use with LS-77), US TC-77,
1 sheet, No. Z6-6-153.

Float switches, US FS-73, 1 sheet, No. Z6-6-89.

Peristaltic pump, US RP-77, 1 sheet, No. Z6-6-204.

Stacom manometer, 1 sheet, No. Z6-6-149.

Manual bed-material piston-type hand sampler, US BMH-53,
1 sheet, No. Z6-6-31.

Manual bed-material reel or hand line sampler, US BMH-60,
3 sheets, No. Z6-6-50 to 52 inclusive. Shipping crate for
sampler, 1 sheet, No. Z6-6-126.

Manual bed-material heavy reel sampler, US BM-54, 3 sheets,
No. Z6-6-21 to 23 inclusive. Shipping crate for sampler,
1 sheet, No. Z6-6-124.

Visual-accumulation-tube particle-size analyzer, US VATSA,
7 sheets, No. Z6-6-24 to 30 inclusive.

Automatic tracker kit for VATSA, 5 sheets, No. Z6-6-91 to
95 inclusive.

Vertical transit rate pacer, US VTP-73, 1 sheet, No. Z6-6-108.

Laboratory sample splitter, beaker version, US SS-72A,
1 sheet, No. Z6-6-87.

Laboratory sample splitter, tray version, US SS-72B,
1 sheet, No. Z6-6-88.

Plastic shaker sieve rings, US SR72A,B & C, 1 sheet,
No. Z6-6-98.

Ordering Instructions

Equipment and reports listed in the catalog are manufactured by commercial firms selected through a competitive bid process supervised by the U.S. Army Corps of Engineers, St. Paul District. Calibration and quality assurance checks are performed by or under direct supervision of project personnel. Because the project is funded and staffed by the federal government, the project is authorized to provide items only to federal, state, or local governmental units, U.S. based consulting engineering firms or U.S. educational institutions. Other firms or foreign governments may usually purchase equipment from the manufacturers. Interested parties are invited to contact the project for names and addresses.

On purchase order forms the "vendor" should be completed as follows:

District Engineer
U.S. Army Engineer District
1135 U.S. Post Office Building
St. Paul, MN 55101-1479

The purchase order may be mailed to the above address or, to speed delivery, may be mailed to:

Federal Inter-Agency Sedimentation Project
St. Anthony Falls Hydraulic Laboratory
Two Third Avenue S.E.
Minneapolis, MN 55414-2196

Even though equipment may not be delivered and invoiced until the following fiscal year, billing will be charged to the year cited on the purchase order.